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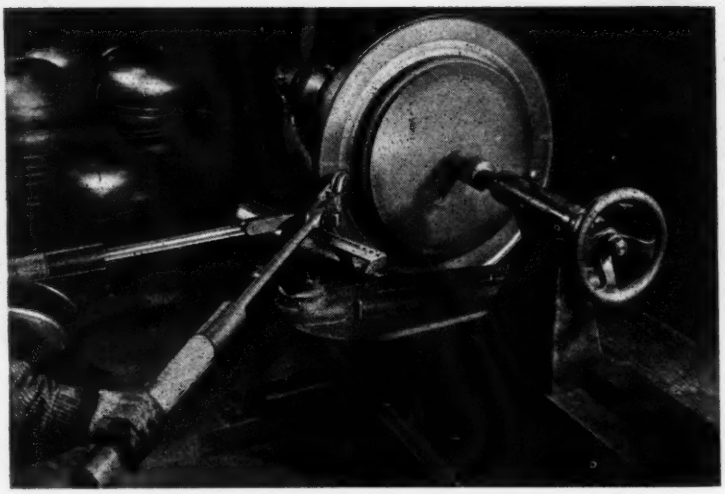
METAL SPINNING BY MODERN METHODS

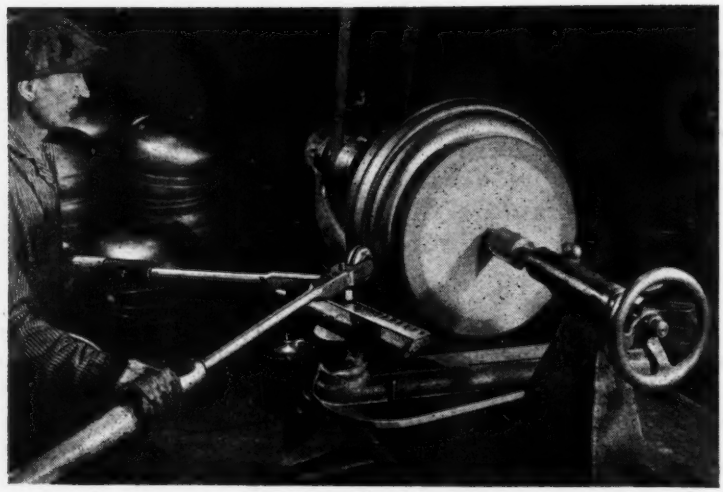
While Metal Spinning is an Old Art, Its Applications in Modern Industry are Manifold, and New Methods have Greatly Extended Its Scope

By EDWIN WEISS, Chief Engineer
Milwaukee Metal Spinning Co.
Milwaukee, Wis.

THE fact that during the war years many fields of science and industry have progressed at a rapid pace is known to all. There have been entirely new discoveries, and important improvements have been made in existing designs, materials, and techniques.

While the metal spinning process was introduced into the United States about a century ago, the secrets of the craft were always jealously guarded, and as a result, its advantages were not generally understood. The war, however, proved to be the opportunity to demonstrate just what it is possible to produce by this little-known ancient forming method. With the advent of war, manufacturers were faced with the necessity of getting parts made in a hurry.





The metal spinning method was suggested to avoid investments in expensive dies, and many parts that heretofore had been considered impossible to spin were experimented with.

All this accelerated the development of advanced techniques, and as a result, it is now possible to spin harder metals, heavier thicknesses, and larger diameters than ever before. Because of these advances, post-war industries may find in spun parts a practical answer to problems of reduced costs, improved products, and speedy entrance into civilian markets.

Metal spinning is a craft or art—a field of individual accomplishment, where much depends on the skill and technique of the spinner. The machine used for metal spinning is a lathe similar to a wood-turning lathe but having higher speed and power. The first requirement is a chuck, or spinning block, as it is commonly known. Hard maple, especially selected and cured, is used for the wooden blocks. They are built up of cross-grained strips or layers, 1 inch thick, laminated and glued together, and turned to the exact shape of the object to be spun.

On some spun parts, exacting tolerances are required or an exceptionally smooth finish is necessary. In those instances, it is advisable to prepare precision machined steel blocks. This also holds true when the material to be spun is of a very heavy gage and

Fig. 1. (Top) First Breakdown Spinning Block Mounted in Lathe. The Spinner Prepares to Clamp the Circular Steel Blank against the Block

Fig. 2. (Center) The Follower is Placed against the Steel Blank and Block, and the Forming Roller is Pressed against the Blank and the Block while They Revolve at a High Speed

Fig. 3. (Bottom) Second Breakdown Block is Mounted in Lathe, and the Partially Spun Blank is again Operated on

the spinning process would cause wear and tear on the block. When large quantities are required, a steel block stands up under the wear and tear, where a wood block would not.

When the diameter of the article to be spun is quite large, and the spinning is to be done at the outer edge of the article, such as a flange, it is sometimes possible to use a wooden block with a steel ring to protect that point of the block where the pressure of the spinning tool is brought to bear. This block is cheaper than an all-steel block, and yet is strengthened or reinforced at the point where it is subjected to the greatest pressure. Articles of re-entrant design require the use of sectional or collapsible chucks. This makes it possible to remove the finished spinning from the chuck.

Step-by-Step Procedure in Metal Spinning

Perhaps the most practical way to illustrate how metal spinning is done is to follow a job from the blueprint to the finished work. Figs. 1 to 7 portray the actual step-by-step procedure in making a steel spinning about 22 inches in diameter, as shown in Fig. 9. Because of the depth of the spinning, two breakdown blocks (see Fig. 9) are used at the outset to bring the metal partially to the intended contour. The third, or final, spinning block is the one that has been turned

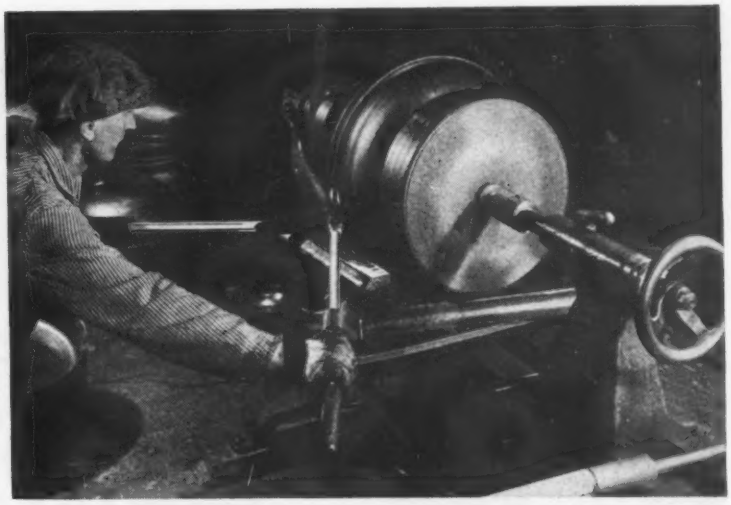


Fig. 4. (Top) The Third Block — Final Spinning Block — is Placed in the Lathe, and the Pressure of the Tool against the Revolving Metal Causes it to Assume the Shape of the Block

Fig. 5. (Center) The Final Spinning Operation Forms the Metal until it Fits the Block like a Glove

Fig. 6. (Bottom) Upon the Completion of the Final Forming of the Part, the Outer Edge is Trimmed and Beaded in the Manner Shown in This Illustration

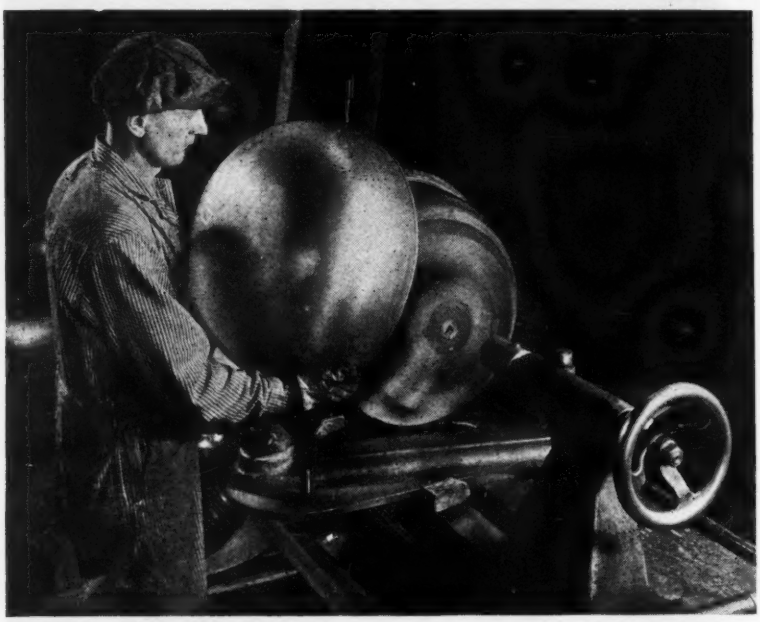


Fig. 7. Here the Spinner is Shown Removing the Completed Spinning after the Performance of the Steps Shown in Figs. 1 to 6

to the exact dimensions of the finished article on the blueprint.

As shown in Fig. 1, the first breakdown block is screwed to the spindle of the spinning lathe. The circular metal blank is then clamped against the block and a follower is placed against the blank and block to prevent "backing up" of the metal blank. The lathe is started, and the block, blank, and follower revolve at a high rate of speed. It might be mentioned here that the speed of the lathe is dependent on the diameter and contour of the shape to be spun, as well as on the gage of the metal. The spinner now selects the type of tool appropriate for the job —in this case a roller type of spinning tool— and expertly presses it against the whirling blank, working from the center to the outer edge of the blank (Fig. 2).

The second breakdown block is mounted in the lathe and the partially spun blank is spun deeper (Fig. 3). The third block—the final spinning block—is then placed in the lathe and the pressure of the tool causes the metal to assume the final shape (Figs. 4 and 5).

Fig. 8. Polishing a Stainless-steel Juice Bowl to a No. 4 Finish. This Piece is Produced by a Combination of Spinning and Welding. The Four Parts from which it is Made are Shown in Fig. 10

When to Select Spinning as the Production Method

There are two methods of forming metal into seamless spherical, conical, or cylindrical shapes —the partially mechanical method of metal spinning and the completely mechanical method of drawing in a press. They do not compete with each other; rather, one is supplementary to the other. The per piece price of metal spinnings usually runs higher than the per piece price of a drawn article. However, the tool cost for spinning is negligible, whereas it may be extremely high for drawing press operations. Therefore, the determining factor as to the method of production is the ultimate quantity over which the tool cost is to be amortized.

On articles of average size, the metal spinning method is generally used for moderate quantities. When the quantities run up to 5000 pieces or more, drawing dies will probably prove an economical investment. As metal spinning is considerably more versatile, it is possible to produce more intricate shapes and much larger diameters than can be economically made by the drawing press method almost without regard to volume.

For example, the company with which the author is connected produces rather large quantities of 102-inch diameter expanded metal parabolas, and is also spinning stainless-steel tank heads as large as 90 1/2 inches in diameter to A.S.M.E. specifications. Drawing dies for either of these articles would prove enormously expensive. A combination of metal spinning and drawing can be used to economical advantage where existing drawing dies can be utilized to form a portion of the depth, with spinning used to obtain the final size.

Metal spinning combined with welding can be employed economically to make parts of great depths in virtually any type of metal. For example, a combination of metal spinning and welding fabrication produced the 36-inch diameter stainless-steel juice bowl seen being polished in Fig. 8. The four parts from which it is made are shown in Fig. 10. The two spun parts are welded to the two rolled and welded rings. The welds are ground smooth, and the unit is then polished both on the inside and outside to a No. 4 finish. The streamline contour obtained through the employment of metal spinnings improves the appearance of the bowl and makes it more sanitary.

What Metals Can be Spun?

Practically any kind of sheet metal and alloy can be spun. The most common metals successfully spun are aluminum and aluminum alloys, steel, stainless steel, copper, bronze, brass, nickel, magnesium, Everdur, Monel, and Inconel. Any metal that can be spun normally can also be spun after perforating. Of course, the contour of the holes has a tendency to elongate in the direction in which the metal is spun, if the deformation is great. Flattened expanded steel has also been successfully spun.

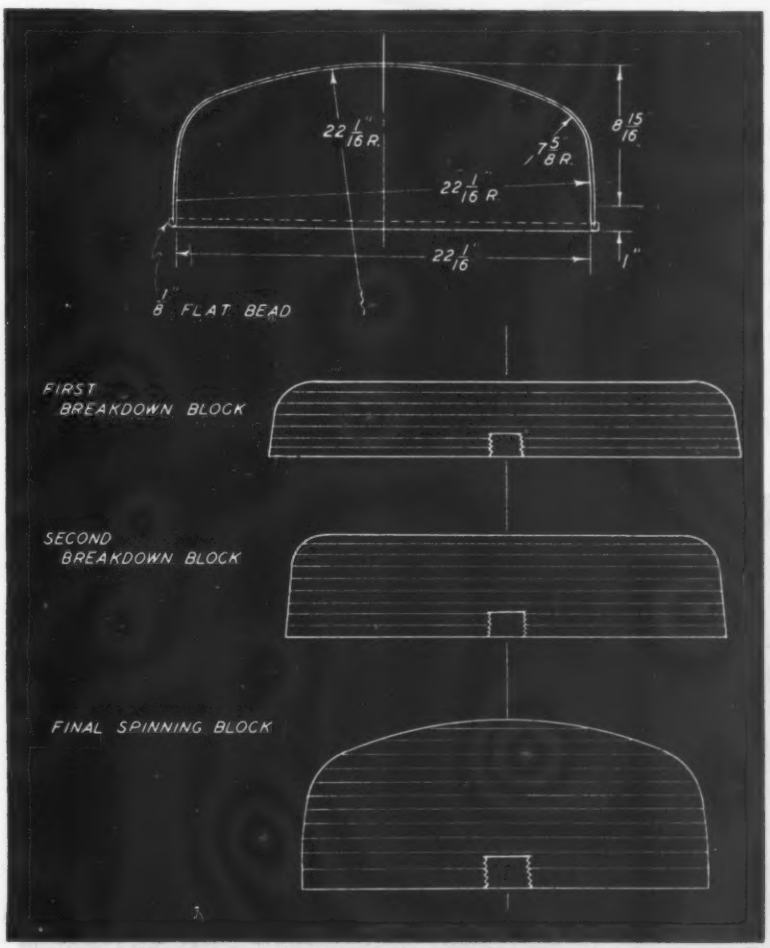


Fig. 9. Illustration Showing the Contour of an Article to be Spun and the Three Spinning Blocks Required to Make This Shape

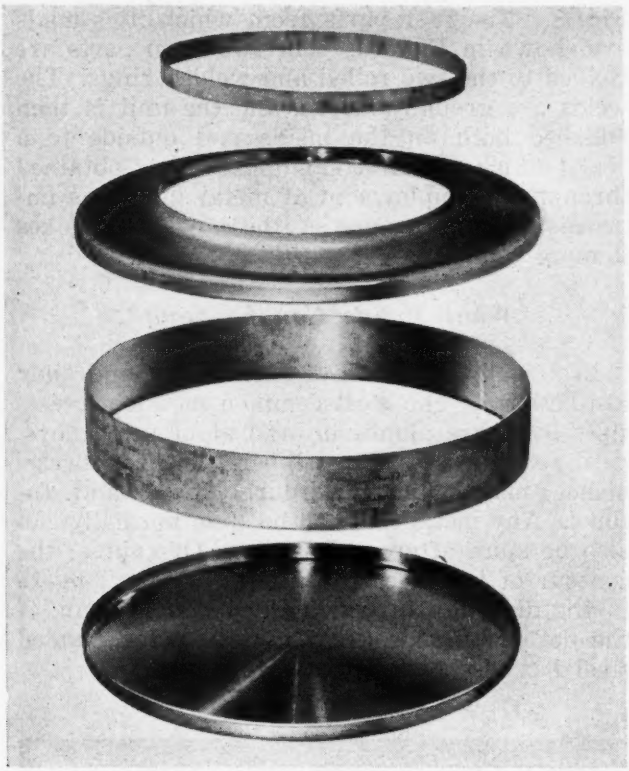


Fig. 10. Two Rolled and Welded Cylindrical Parts and Two Spun Parts Used to Make the 36-inch Diameter Juice Bowl in Fig. 8

In addition to sheet metals, great strides have been made in the spinning of tubing of brass, steel, stainless steel, copper, and aluminum. The expansion and reduction of tubing can be accomplished by the cold spinning process, but the application of heat widens the range. Contrary to popular belief, it is not necessary that large quantities be involved in order to utilize hot spinning. This method of forming is being employed more and more frequently in cases where drawing operations were previously used. In our plant we have hot spun steel tubing with as much as 1/2 inch wall thickness. The most common practice is to use rollers instead of friction tools. In hot spinning, it is advisable to keep the rollers cool, either by means of a coolant pump or by allowing the rollers to rest in oil between the spinning operations.

An Example of Hot Spinning

An interesting example of the hot spinning of steel tubing is the high-pressure gas container shown in Fig. 11. The customer furnished S A E 1015 seamless steel tubing, 3 5/8 inches outside diameter by 2 7/8 inches inside diameter, the walls being about 3/8 inch thick. Starting 3 inches from the end, the tubing was machined to a thickness of 9/64 inch up to the end that was spun shut by the hot spinning method. It was very important that the metal at the spun end be maintained at the original 3/8 inch thickness, because the burden of pressure is at the spun end.

Figs. 12 to 15 show the spinning operation which closed the end of the tubing. After the spinning operation was completed, a hole was drilled in the center of the end that had been spun shut.

In the process of spinning, many metals have the tendency to "work-harden." Hence annealing is necessary—sometimes several times between spinning operations—to restore the metal to a workable condition. This is usually the case in spinning 52S aluminum alloy, Monel, stainless steel, copper, and brass.

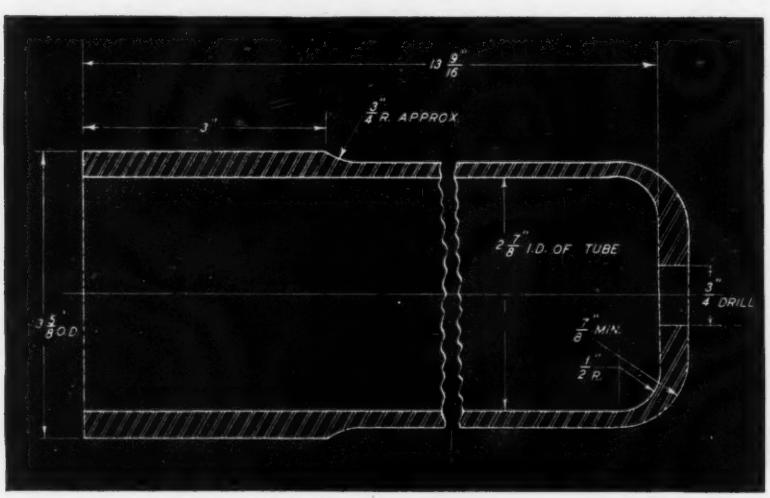


Fig. 11. Seamless Steel Tubing, the End of which is Closed in by Hot Spinning to Form a High-pressure Gas Container

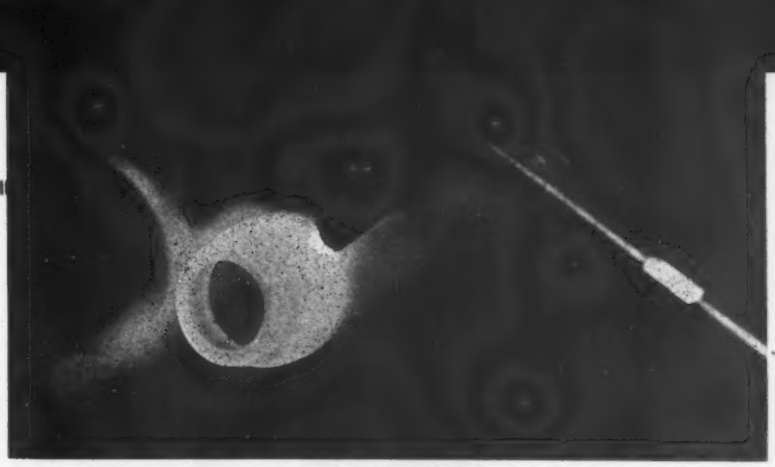


Fig. 12. First Step in Closing the End of the Steel Tube Shown in Fig. 11 by the Hot Spinning Process

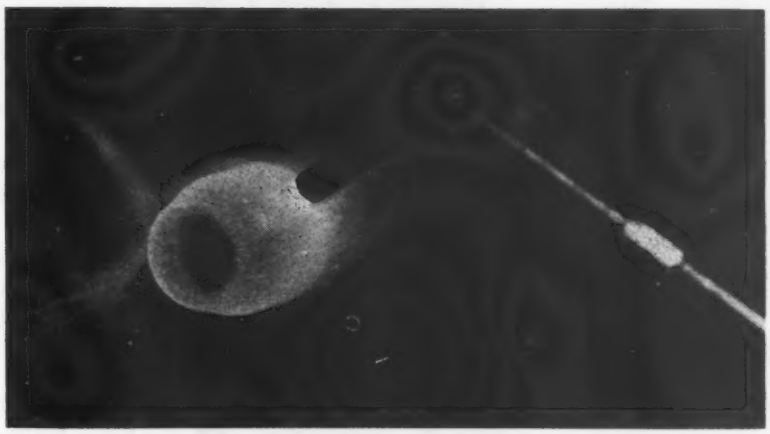


Fig. 13. Second Step in the Hot Spinning of the End of the Steel Tube Shown in Fig. 11

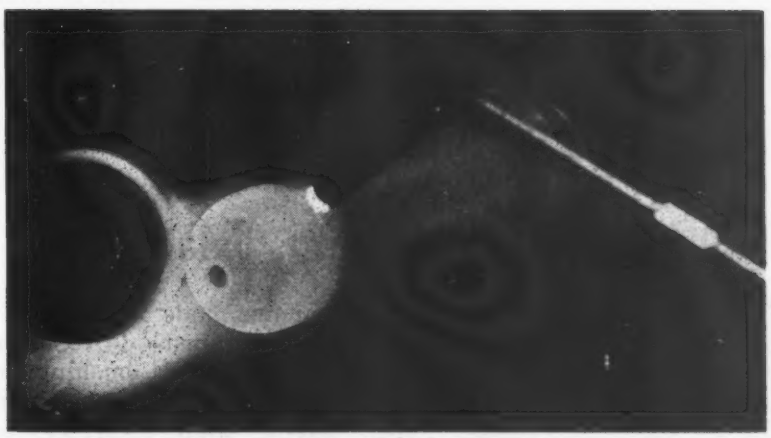


Fig. 14. Third Step in the Hot Spinning of the Steel Tube. Here it will be Seen that the End of the Tube is Almost Closed

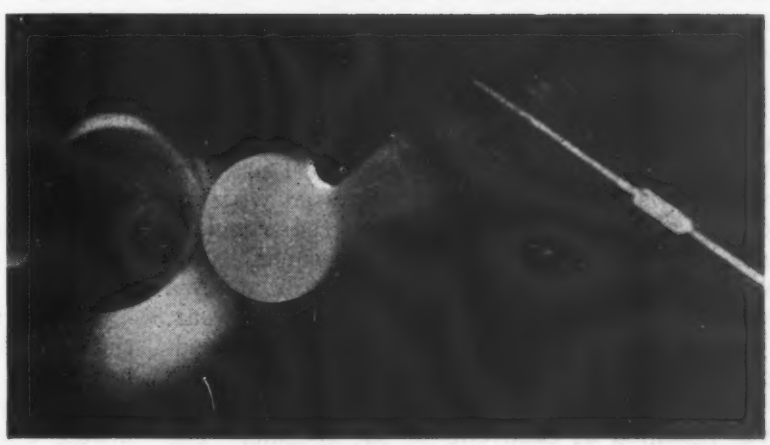


Fig. 15. Final Step in the Hot Spinning of the Tube. It will be Noted that the End of the Tube is Now Entirely Closed

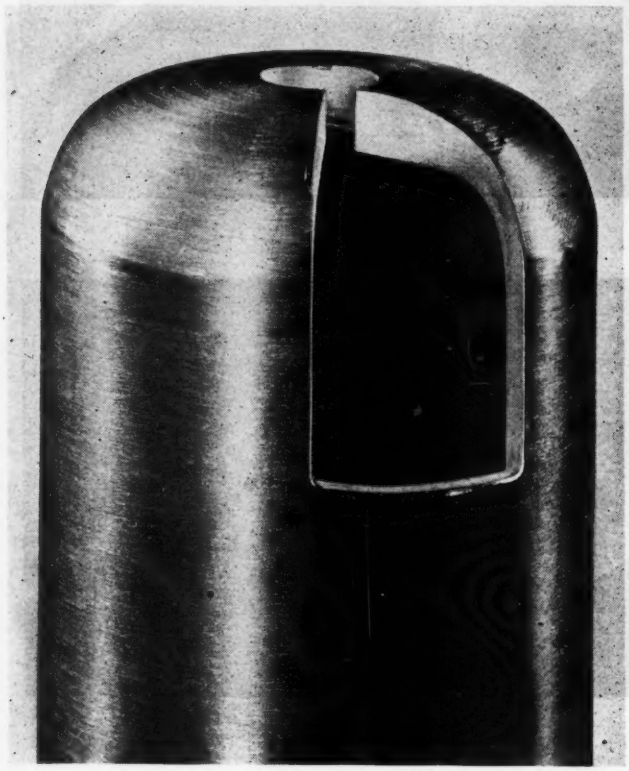


Fig. 16. Spun Tubing with Part Cut out to Show Thickness of Metal at Spun End

The size of spinnings made in the plant where the writer is employed ranges at present from tiny parts, of 1/2 inch diameter, to parts as large as 102 inches in diameter. A few years ago, the spinning of such large diameters was believed impracticable. Tomorrow even larger sizes may be spun. The illustration at the beginning of this article shows the spinning of a stainless-steel tank head 90 1/2 inches in diameter. These tank heads form the ends of the inner lining of milk storage tanks used in milk-handling plants. Previously formed by "bumping," these heads are now spun from two half-circles of stainless steel, welded in the center, and ground smooth. After spinning, the interior of the tank head is polished to a No. 4 finish.

Almost every industry today can use metal spinning to advantage. Scores of concerns have already had experimental and production quantities of formed metal parts made by metal spinning. It is reasonable to assume that the experience manufacturers have had with the economical, speedy, and efficient production of vital weapons of war will convince them of the advantages of utilizing this forming method in the development of post-war products—whether of new design or old design modernized. In this endeavor, the experience of the metal spinning specialist will prove most valuable.

High-Speed Bearings Made from Cemented Carbide

THE installation of sleeve type bearings made of solid cemented carbide running against solid cemented carbide in place of standard ball bearings on a toolpost grinder made it possible for the Carboloy Company, Inc., Detroit, Mich., to use toolpost grinders under conditions that caused heavy overloads on the ball bearings. It is said that under the severe conditions encountered, the Carboloy bearings increased the bearing life fifty times.

The machines are used for grinding internal and external surfaces of carbide die nibs. Diamond wheels are used, and the wheel pressure required is about ten times that used with ordinary abrasive wheels. Hence, the standard ball bearings of the spindle were considerably overloaded and ran accurately only for about a week, after which they showed signs of wear.

To overcome this, a set of Carboloy cemented-carbide combination thrust and radial load sleeve bearings with conical bearing surfaces was installed at each end of the spindle. The inner half of the bearing is made from Grade 44A Carboloy, which is widely used for drill jig bushings and lathe centers. This half is attached to the spindle by Woodruff keys, and the surfaces of these inner bearing members are grooved for lubrication. The stationary outer bearing members are made from Grade 78B Carboloy, which is particularly tough and wear resistant.

The conical surfaces take the bearing load, while the cylindrical portions of the bearings may have a clearance of from 0.0005 to 0.0008 inch. The bearing surfaces are lubricated with a mixture of kerosene and colloidal graphite. The lubricant is applied by placing a few drops in a small cup, and reaches all bearings through wicks.

The carbide-to-carbide bearings, subjected to the same service as standard steel ball bearings, have been in operation for more than two years, with two eight-hour shifts per day. The measurable wear is said to be only 0.000004 inch.

Forging Aluminum Aircraft Pistons on Mechanical Presses

A Forging Method that Differs Greatly from Customary Procedure in the Production of Aluminum Pistons – Developed by the Buick Division of General Motors Corporation

By CHARLES O. HERB

FIRST among the war jobs of the Buick Motor Division of the General Motors Corporation was the building of Pratt & Whitney aircraft engines. In the first thirty months of the war, more than 50,000 of these engines were produced. The average monthly output of engines had a combined rating of over two million horsepower. With this wartime record, Buick became one of the world's foremost builders of radial aircraft engines.

When the concern began the production of aircraft engines in January, 1942, the pistons were purchased from an outside source. Experience in seeking sources of supply to meet schedules indicated that qualified suppliers would not be able to handle the entire volume. It was therefore apparent that Buick would have to forge the pistons necessary for its own assembly plants.

A method was developed for forging these aluminum alloy pistons that differs greatly from the usual upset method employed by other manufacturers. The new method involves the use of a forging press of 2000 tons capacity. The process is carried out at the Flint, Mich., plant of the concern. There, the aluminum alloy is received in the form of round bars 3 1/2 inches in diameter by 10 feet in length. The material specification calls for A.M.S. 4145 or 32S aluminum alloy.

After being carefully tested for conformity to the specification, the bars are cut up into lengths of 7 1/2 inches by employing an abrasive sawing machine. These billets are weighed to insure uniform accuracy. They must each weigh 7.1453 pounds within limits of plus 3/4 ounce, minus zero. In other words, the billets can be slightly over weight but never under weight.

After being cut, the billets are polished to remove any burrs left from the sawing operation. They are then placed in the conveyor type

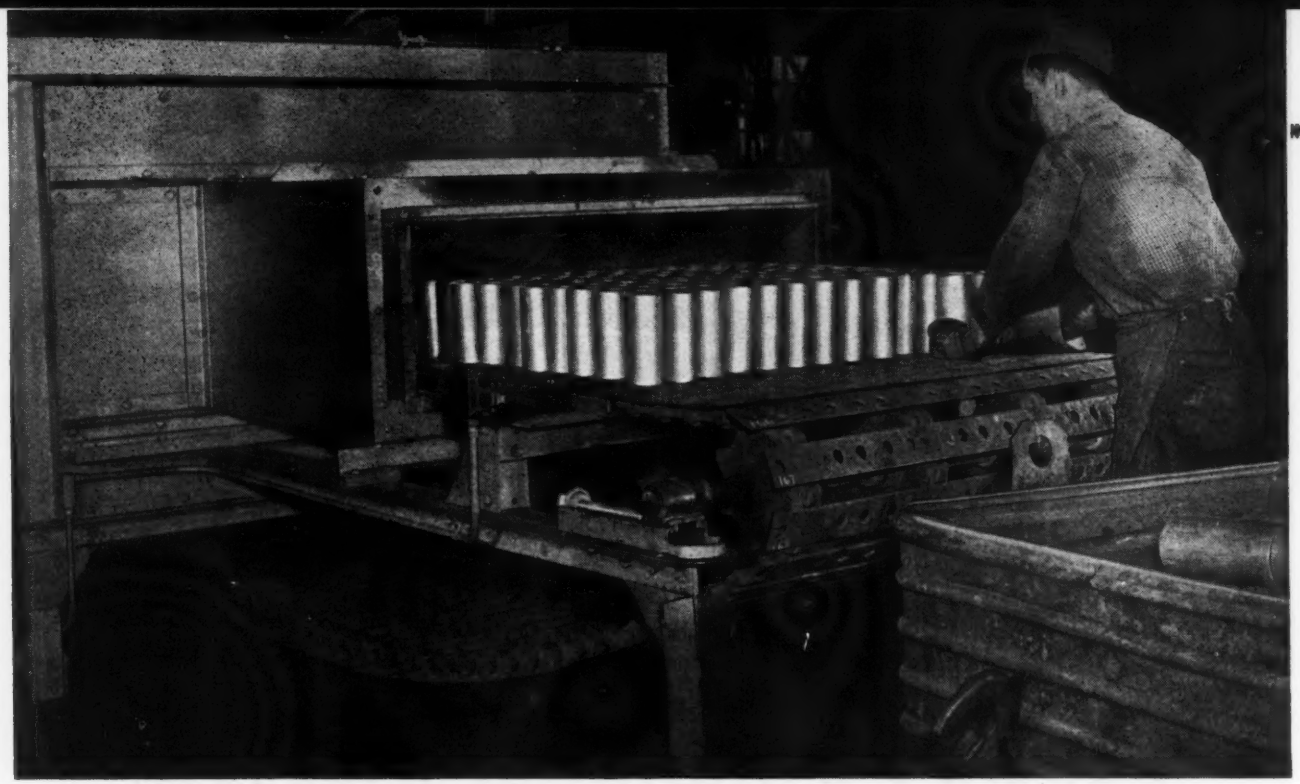


Fig. 1. The Billets of Aluminum Alloy are Run through a 25-foot Conveyor Type Furnace Operated at a Temperature of 850 Degrees F. They Remain in This Furnace 3 1/2 Hours

furnace illustrated in Fig. 1, which is operated at a temperature of 850 degrees F. The billets remain in this furnace for approximately 3 1/2 hours.

When they are removed from the furnace, the billets are placed directly in a die on the forging press, and with one stroke of the press are formed into a truncated cone shape, as shown by the second example from the left in the heading illustration. This cone-shaped piece is automatically ejected from the die by an air-operated device, and is placed manually in a bottom-forging or pot die on the same press. Here the cone-shaped piece of aluminum is rough-blocked into the piston shape by a second stroke of the press.

For this rough-blocking operation, the forming tool or punch is sprayed with a saline solution having a ratio of 16 pounds of salt to 18 gallons of water. The salt acts as a lubricant and prevents the heated billet from sticking to the forming tool. Without the application of the saline solution, the forming tool would stick to the aluminum on its first contact and pistons could not be forged.

After the rough-blocking step, the forming tool holder, which carries two forming tools, moves into the second position on the press, actuated by an air cylinder. The piston is finish-blocked in the same die as the one in which it was rough-blocked by a third stroke of the press, after which the piston is again ejected by an air-operated device. The actual time required to perform the three press strokes is less than twenty seconds, although the billet must be moved between the first and second strokes. The speed of the operation makes it difficult for the eye to follow. Fig. 2 shows a close-up view of the dies and forming tools or punches as they are arranged on the press.

The two forming tools are similar in appearance, the second tool being used to bring the cooling fins into deeper relief, round the knuckle-pin bosses, and thin out the side wall. Two views of the finish-forming tool or punch are shown in Fig. 3. The forming tool used in finish-blocking is sprayed with a lubricant that consists of a 30 per cent graphite oil mixed with Gulf Endurance oil in the ratio of 1 to 5. These oils have exceptionally low flash points and a high lubricating value.

After the pistons have been forged, they are placed on trays, single depth, and allowed to cool to room temperature during a period of approximately five hours. This slow, natural cooling prevents distortion or "squashing." The pistons are then cleaned in the usual sequence of caustic soda, water, nitric acid, and water baths, and inspected visually for any defects.

The small extrusions or projections resulting from vent holes in the forming tools are removed by a special Buick-built machine, after which the pistons are faced to length on a Fay automatic lathe. A tolerance of 0.002 inch is

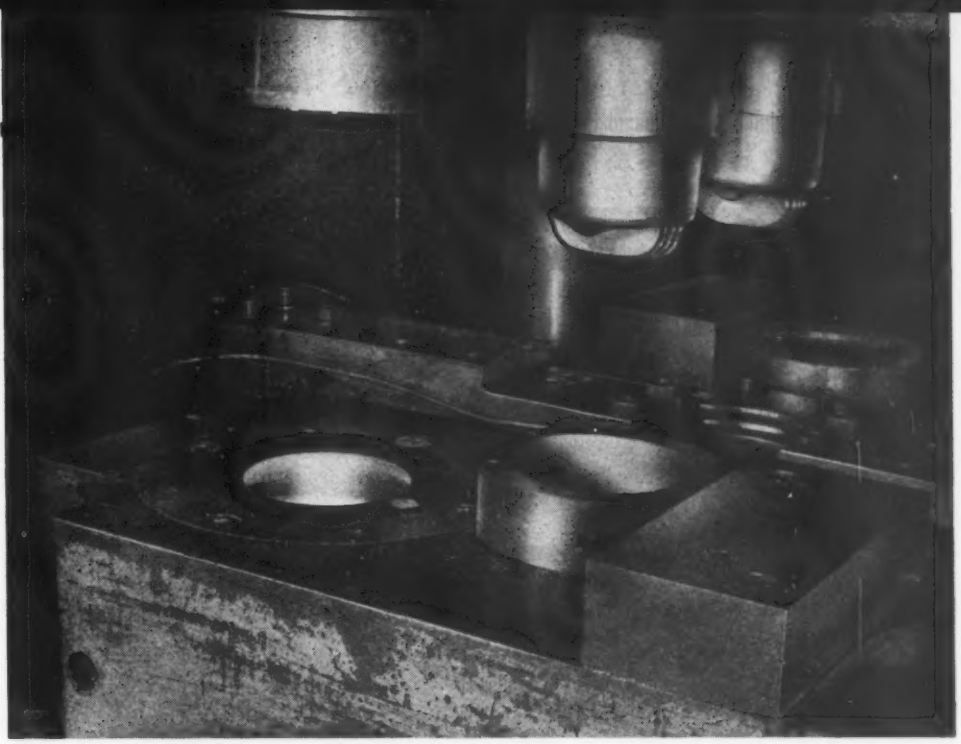


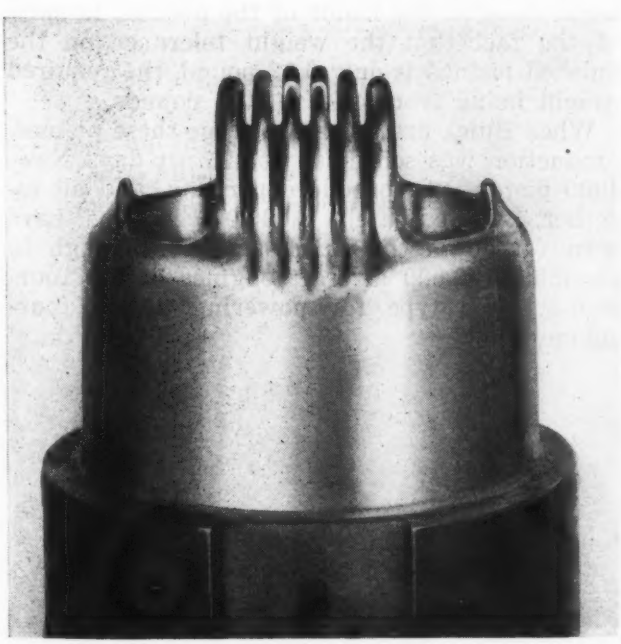
Fig. 2. The Pistons are Blocked into a Truncated Cone in One of the Two Dies Seen in This Illustration, and are then Rough- and Finish-blocked into the Shape Shown Third from the Left in the Heading Illustration by Employing a Second Die that is Served by Two Forming Punches

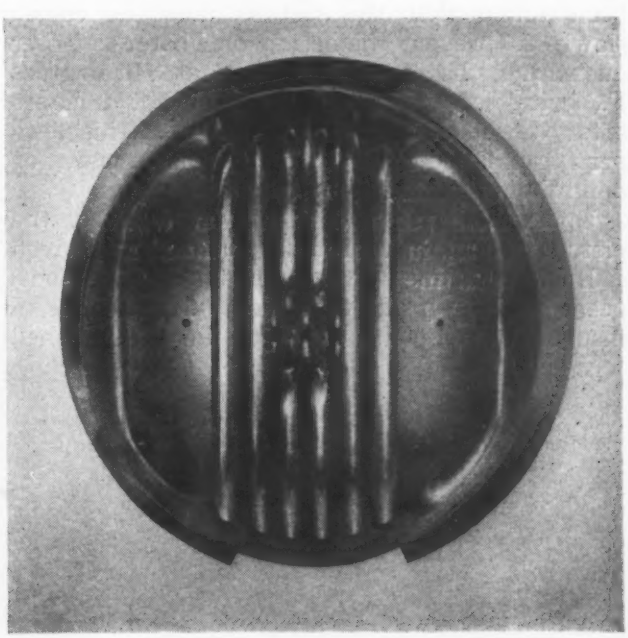
specified on the length of the pistons. This operation is performed to make sure that all pistons are of the same length before going into the nose forming die.

The pistons are then subjected to a temperature of 625 degrees F. for one hour in a conveyor type gas-fired furnace, after which the skirt of the piston is closed in the manner shown at the extreme right in the heading illustration. This operation is performed on an Ajax 1000-ton press equipped with the tooling illustrated in Fig. 4. Lubricant is used on the forming tool for this operation also, the mixture consisting of one-half 30 per cent graphite oil and one-half Gulf Endurance oil.

The pistons have now attained their pre-machined characteristics and are ready for heat-treatment. Four hundred pistons are placed in a cylindrical basket, and two baskets thus loaded are placed in a furnace at one time and heated for ten hours. The pistons are held in the furnace for at least six hours after the

Fig. 3. Two Views of the Finish-blocking Forming Tool or Punch Used in the Press Set-up Illustrated in Fig. 2





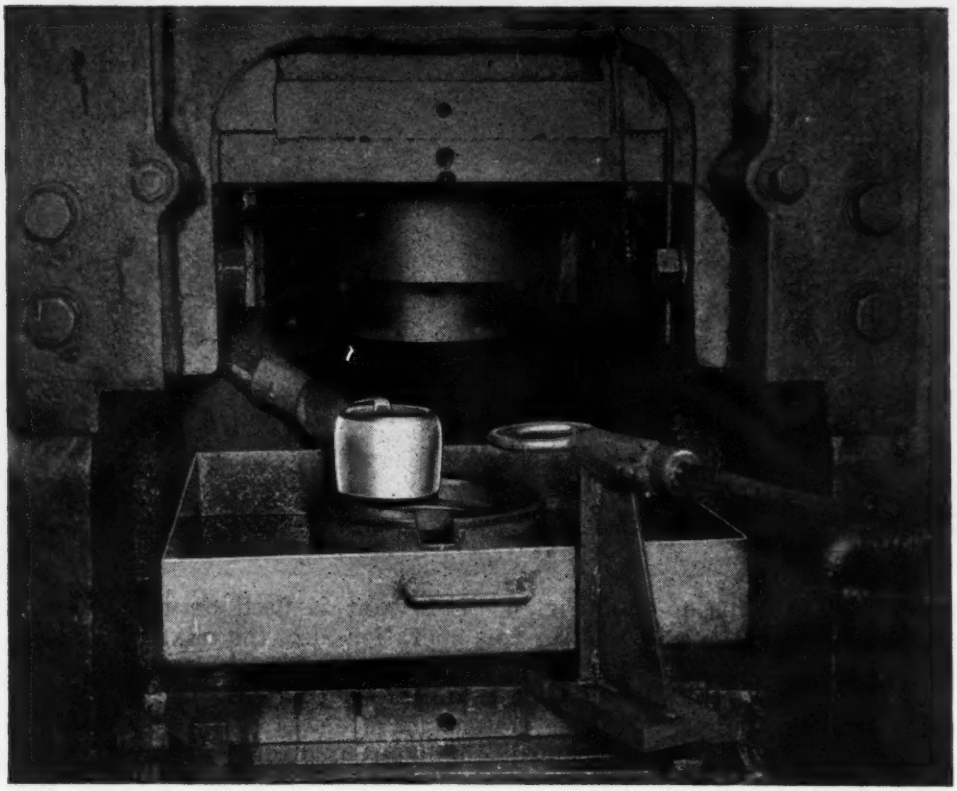


Fig. 4. Nosing the Open End of the Piston is the Final Forging Operation, the Pistons being then Inspected and Heat-treated, Ready for Machining

inside thermo-couple has indicated a temperature of 960 degrees F., and the minimum time that the pistons can be held in the furnace is ten hours.

The pistons are then quenched in a tank of water. The temperature at the top of the quench is held to about 130 degrees F., and that at the bottom of the quench to 90 degrees F. It has been found that the pistons must be cooled slowly to prevent distortion or blisters. After quenching, the pistons are aged at 340 degrees F., being left in the furnace for 7 1/2 hours after the inside thermo-couple shows this temperature. They are also held in this furnace for a minimum of ten hours.

Upon their removal from the furnace, the pistons are again thoroughly cleaned and given a Brinell hardness test. They are next shot-peened on the inside for seventy-five seconds to insure the requisite strength in the finished product. After the peening operation, the pistons are again rigidly inspected and placed 235 in a box for shipment to the Melrose Park, Ill., plant, where they are finish-machined and assembled into aircraft engines.

One of the features of this method of piston production is the unusually close limits specified for a forging operation. Practically no machining is done on the inside of the pistons, in spite of the fact that the weight tolerance on the finished pistons is only 0.02 pound, the required weight being from 4.12 to 4.14 pounds.

When Buick first began to forge these pistons, production was scheduled at 225 per day. Now, 4000 pistons are produced per day, and all together, approximately 2,000,000 pistons have been forged in the Buick shop, or enough to assemble 140,000 aircraft engines of the fourteen-cylinder type for powering 35,000 four-engine bombers.

Gear Production Problems Solved by Automatic Welding

By R. P. SHARER, District Manager and Welding Engineer
The Lincoln Electric Co., Cleveland, Ohio

ONE of the post-war developments in the welding field will undoubtedly be the greatly extended use of automatic equipment. Typical of the jobs for which automatic welding has proved advantageous is that of producing main-drive gears for an oil-pumping unit built by the International Derrick & Equipment Co., Columbus, Ohio.

The gears, originally made of cast steel, were first welded manually; later automatic welding by the "Lincolnweld" method was adopted. Although the manually welded gear blanks were satisfactory in that there was an improved quality of the finished job, it was not until the gear units were designed for "Lincolnwelding" that the highest production efficiency was obtained at lower cost.

The parts that make up the gear assembly are the rim and hub, which are forged, and the web, which is cut out by a multiple-tip flame cutter, as shown in Fig. 1. These parts are assembled on a turntable with a cone located at the center of the rotating positioner, which accommodates all the sizes of blanks fabricated. The positioning fixture tilts the work and rotates the assembly at a predetermined speed, placing all welds in a "down-hand" position.

As the work turns, the welding head deposits the granular flux just ahead of the arc, as seen in Fig. 2, where the rim is being automatically welded to the web. In the manual method of welding these parts, the gear blanks were preheated to avoid cracking. With "Lincolnweld," the initial pass along the rim provides all the necessary preheat. The slag is removed while the work is rotating, and the second pass is deposited without stopping the turntable.

To weld the hub to the web, as shown in Fig. 3, the automatic welding head, suspended on a swivel, is positioned over the joint and, as in the previous case, the work turns while the head remains stationary. For this part of the gear fabrication, the 7/32-inch diameter welding wire which is used for both joints is set

Fig. 1. Flame-cutting the Holes in the Web for an Oil-pump Gear Unit which is to be Assembled by the "Lincolnweld" Automatic Welding Process

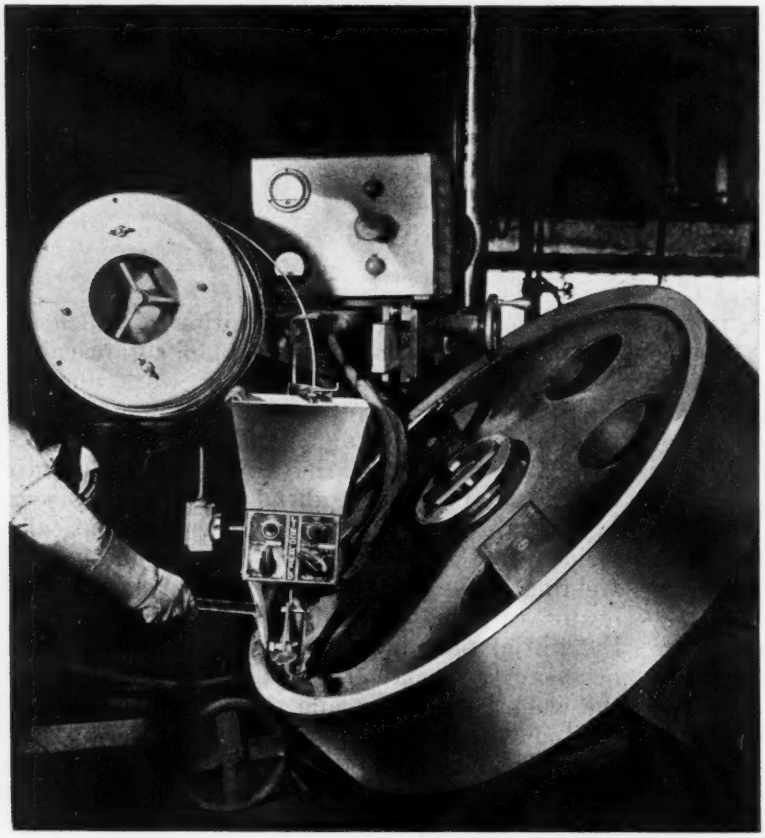


Fig. 2. Automatically Welding the Rim to the Gear Web by the "Lincolnweld" Method. As the Work Turns, the Welding Head Deposits the Flux just ahead of the Arc

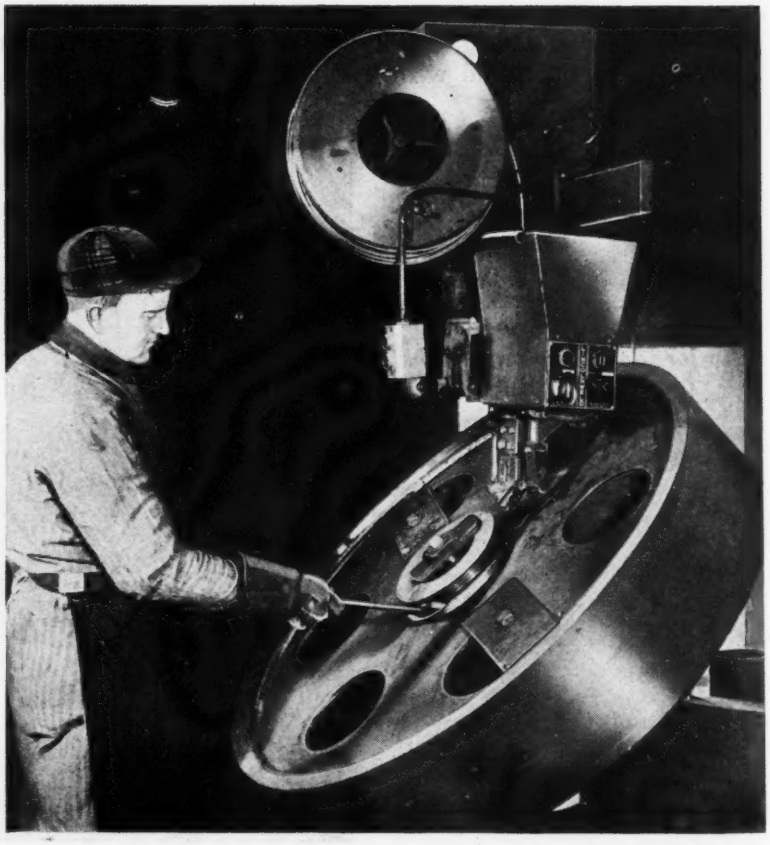


Fig. 3. Automatically Welding the Hub to the Web in Herringbone Gear Blank Construction. The Work is Held in a Tilted Position by the Welding Positioner, and the Welding Head is Suspended on a Swivel over the Work

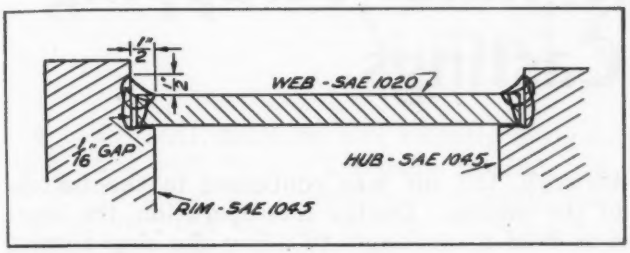


Fig. 4. Diagrammatic View Showing Details of Joint Arrangement for Automatic Welding: Left, Rim to Web; Right, Hub to Web

about 2 inches off center, or the length of the crater. Also, due to the smaller diameter of the hub section, a small flux retainer is suspended behind the deposited flux to prevent it from dropping off the seam prematurely. The hub rotates counter-clockwise.

Details of the rim-to-web joint and the hub-to-web joint are outlined in Fig. 4. The rim is of S A E 1045 steel with an edge thickness of 1 1/2 inches and a thickness of 1 3/4 inches at the point where it joins the web plate. The hub, also of S A E 1045 material, is approximately 2 3/8 inches thick, while the web, of S A E 1020 steel, is 1/2 inch thick. Both joints require two passes of the welding wire.

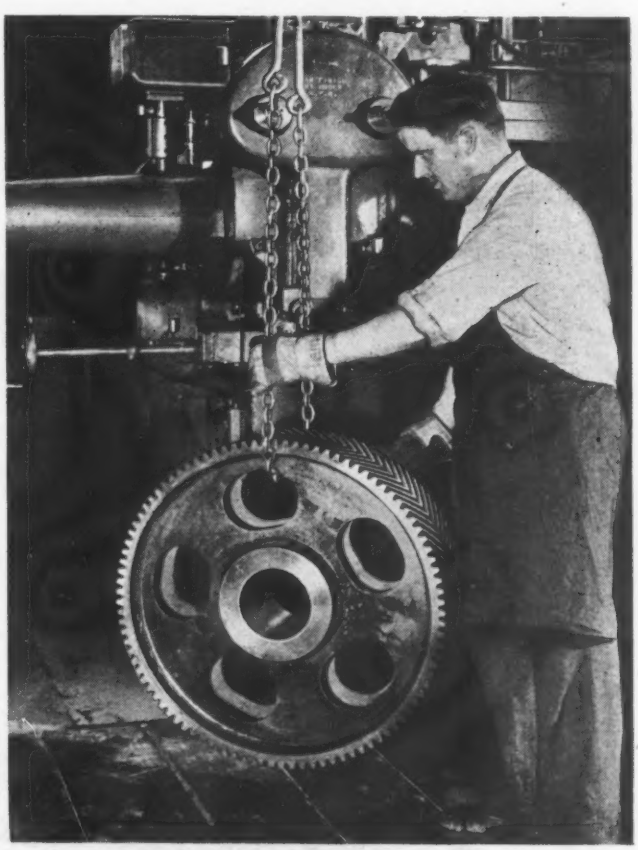
In addition to the reduction in cost and improved quality of fabrication made possible by the automatic process, the speed of machining the welded gear and of cutting the teeth has been increased by 50 per cent, due to easier machinability and less volume of metal removed; and the cutting tool life has been doubled. The former cast-steel gear blank was heavily ribbed and required the removal of about three times as much stock as the present welded design. All units are heat-treated to a Brinell hardness of from 270 to 290 before machining. Owing to the increased hardness obtained by heat-treating in the welded design, it has been possible to increase the horsepower capacity of the oil-pumping unit equipped with these gears.

The general appearance of the finished gears (see Fig. 5) indicates the improvements effected by fabricating these units by welding.

Effect of Increasing Wages in the Face of Reduced Production

Increases in the money wage brought about through union or legislative coercion in the presence of reduced productive efficiency can ultimately have one of two results. First, prices may increase faster than money wages can be increased, thereby reducing the national living standard, bringing acute distress to those whose incomes are static or relatively inflexible, and leading to severe inflation. The second possible result of arbitrarily increased money wages in the presence of reduced productive efficiency and artificially suppressed prices will be the reduction of business profits, multiplied bankruptcies, failure of business to attract capital, and consequent unemployment. Either of these results will defeat the generally accepted purpose of attaining high post-war employment and an abundant economy, as well as a stable society.—*Louis Ruthenburg*

Fig. 5. Completed Gear of 28-inch Diameter, Ready for Installation in Gear-box



Oxygen Lancing Facilitates Scrapping of Huge Castings

SINCE the oxygen lance can sever metal of practically any thickness, it is an effective "trouble-shooter" for metal-disposal problems. In many scrapping problems like that here illustrated, the oxygen lance is the only practical tool available.

A metal-working plant recently had to scrap a 100-ton steel casting. The cost of the usual method of disposing of scrap material used by this plant proved prohibitive for a job of this unusual size. It was decided that oxygen lancing was the only feasible means of cutting the huge piece. The results obtained by this method were so satisfactory that the company disposed of two other castings, each weighing 17 1/2 tons, in the same way.

Despite snow and sub-zero temperatures, the lancing operation was begun immediately. Lancing was started about 28 inches below the top of the casting, which at this point was 5 feet thick. After a hole had been lanced completely through, the cut was continued to the bottom of the casting. During this operation, the lance was held at an angle to allow the slag formed in cutting to run out away from the face of the cut. When the required number of these lance slots had been completed, the remaining web of material at the top of the casting was severed with a standard oxy-acetylene cutting machine. The resulting slabs were then easily cut up with the oxy-acetylene machine into suitable sizes for shipment.

When men value ease and security more than adventure and accomplishment, it is a sign that they are getting old; and a nation is beginning to get old when its citizens are willing to trade freedom for financial security, ease, and reduced individual responsibility.

Huge 100-ton steel casting being cut up for scrap with an oxygen lance. Three completed lance slots are seen to the right, the oxygen lance having cut through sections of steel as much as 5 feet thick. The men standing on the casting are making a supplementary cut with an oxy-acetylene cutting machine (Photo Courtesy The Linde Air Products Co.)

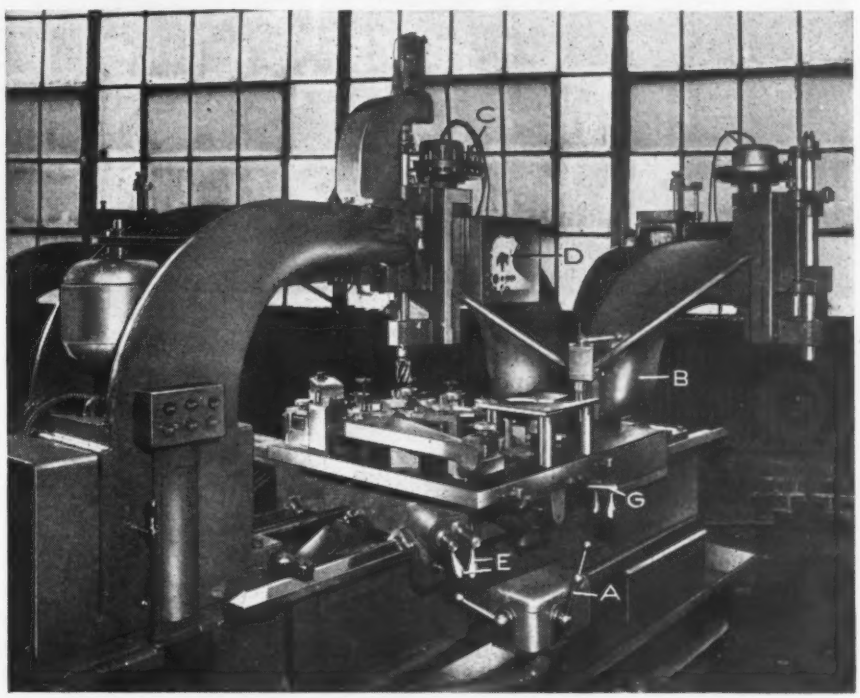
Unusual Machine Performs Many Varied Operations

A SPECIAL machine tool recently designed and built by the Lehmann Machine Co., St. Louis, Mo., combines vertical milling, side milling, end milling, drilling, reaming, and boring operations, so that one side of the work to be machined is completed with one clamping on the table. Two views of this machine are shown in Figs. 1 and 2. Among the features should be mentioned that all the feeds are controlled hydraulically, with positive locating stops for each operation.

The work to be machined is a magnesium alloy casting (most clearly shown in Fig. 3). Forty-two separate machining operations are performed on this casting in a single setting.

Referring to Fig. 1, a pivoted control box is shown at *A*. From this box, the carriage feeds and also the work-spindle are controlled. The spindle speeds vary from zero to rapid traverse in either direction. In the same illustration is shown a pivoted turret *B* with arms carrying the various work-heads. The work-heads are all driven from the same motor through gear drives to secure the proper speed for each spindle.

The first operation performed is to mill certain lugs and other surfaces on the side of the



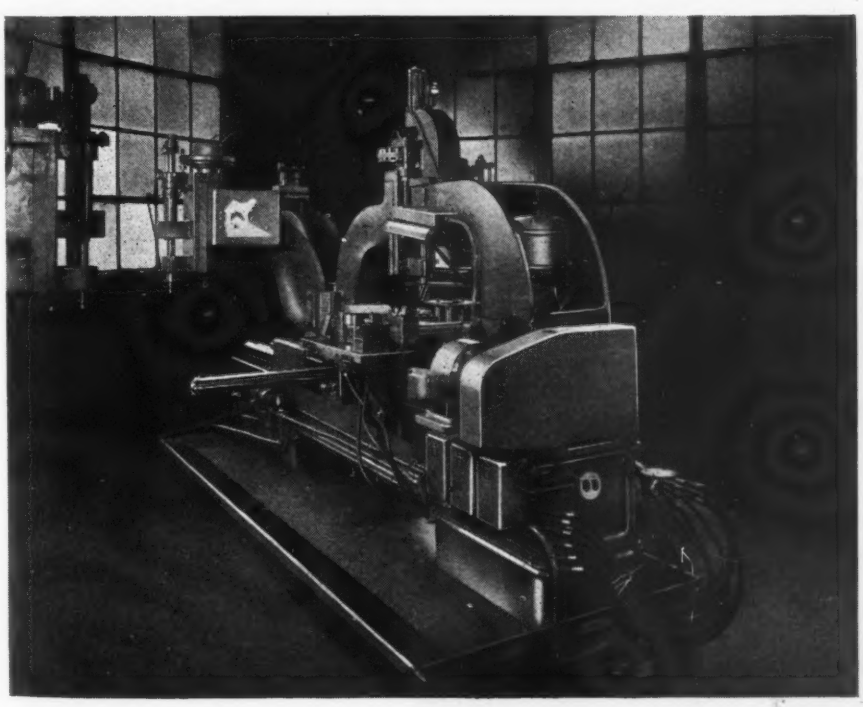


Fig. 1. (Above) Front View of Machine that Performs Forty-two Separate Machining Operations in a Single Setting of the Work

Fig. 2. (Left) Rear View of Special Machine Shown in Fig. 1 that Saved Many Hours of Time in Machining Magnesium Alloy Castings

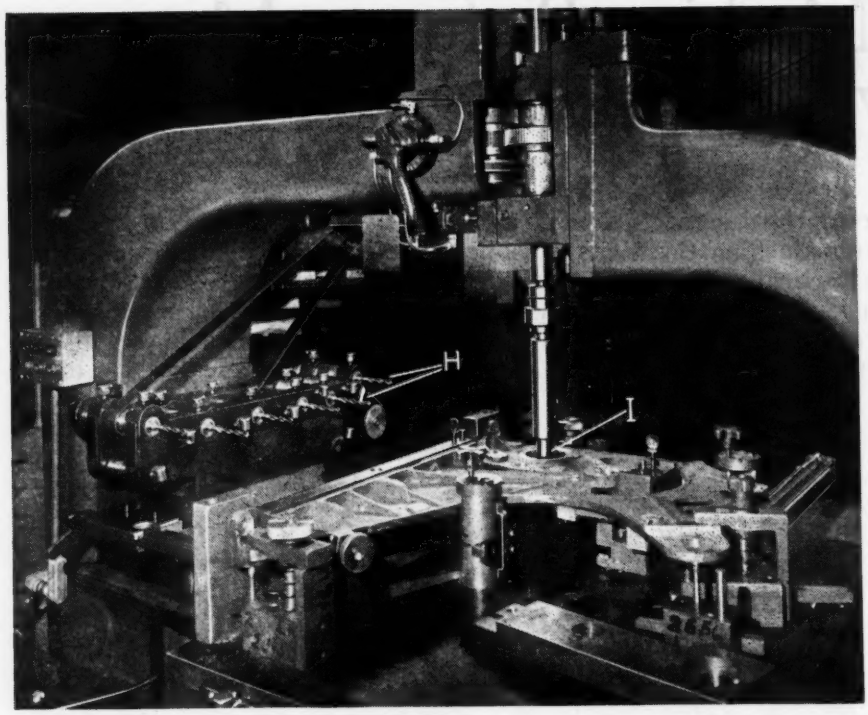


Fig. 3. Companion Machine to that Shown in Figs. 1 and 2, Designed to Machine the Other Side of the Magnesium Alloy Casting

casting, which is done with a 4-inch diameter cutter operating at a speed of 1200 R.P.M. The rate of feed is approximately 36 inches per minute.

Next, a vertical milling operation is performed as shown in Fig. 1, with a 1 1/4-inch diameter cutter running at 1200 R.P.M. The side of the casting turned upward in Fig. 1 has surfaces at nine different elevations to be first rough- and then finish-milled. The ease with which the table can be moved in both directions facilitates the performance of all operations.

The different elevations to be milled are located by means of height gage pins *C* arranged on a rotating carrier disk. For the operator's convenience and to guard against error, the many surfaces to be milled are also indicated on the electrical indicating board *D* on which there is an outline drawing of the work, with signal lamps indicating which height pin is in register for the milling operation. This panel has a green and red lamp for each surface to be milled, one for the roughing cut and the other for the finishing cut.

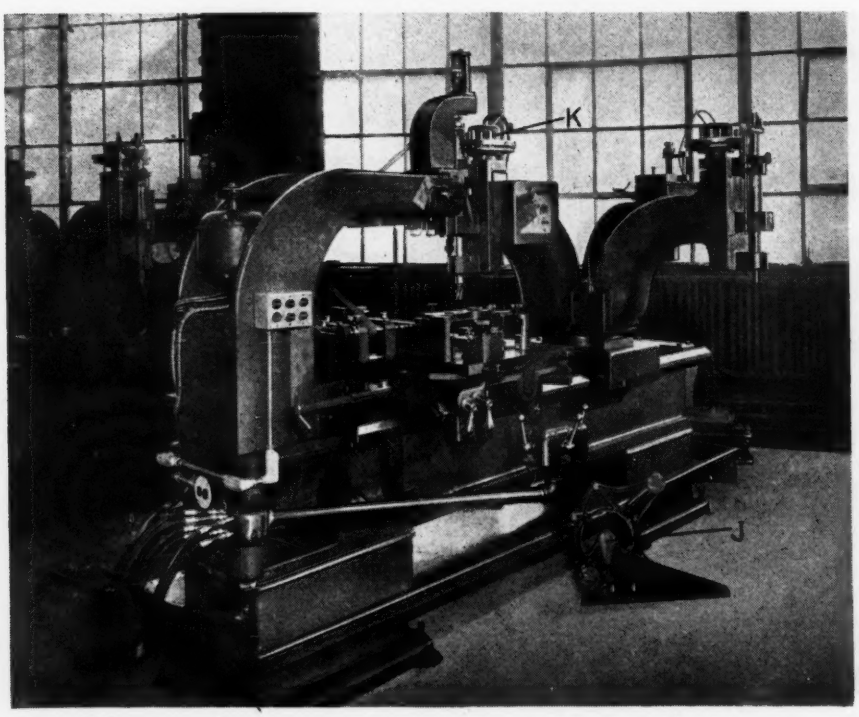


Fig. 4. Another View of the Machine Illustrated in Fig. 3 which Performs a Large Number of Machining Operations in One Setting

The table is equipped with longitudinal- and cross-feed stops, the handles for which are shown at *E*, which positively locate the work-table under the drill spindle for each of the several drilling and reaming operations. The table also has adjustable positive stops for locating for the side milling operation, the handles for which are shown at *G*. There are nine different side milling cuts on the upper half of the work. These cuts are made with a 5/8-inch diameter end-mill revolving at 1800 R.P.M. The total floor-to-floor time for the complete machining of this half of the work is approximately twenty-eight minutes, a noteworthy saving of time, compared with passing the work from one type of machine to another.

In Figs. 3 and 4 is shown a companion machine to the one illustrated in Figs. 1 and 2, which was developed and built to machine the other side of the same magnesium alloy casting. This machine performs surface milling, boring, drilling, reaming, and counterboring operations. It has a multiple drill head at *H* for drilling six holes simultaneously, the table being automatically located in line with the drills. The table of the machine also locates itself automatically in the proper position for the boring of a 2.687-inch diameter hole, as indicated at *I*. The boring-bar travels at 1200 R.P.M., and is provided with a single fly cutter. The bar is piloted in a bushing below the work. The machine is also equipped with a profiling cam follower for machining the surface *J*, Fig. 4. The same end-mill used for machining this surface mills fourteen other elevations on this side of the work. Each elevation is determined by a height gage pin *K*, and is indicated on an electrical control board located on the turret arm.

The floor-to-floor time for fully machining this side of the work is approximately thirty minutes; thus the total floor-to-floor time for both sides is fifty-eight minutes, involving a saving of many hours, compared with machining the casting by passing it from one machine to another.

In the operation of these machines, it was noted that girls, inexperienced in the use of machines, after a short period of training, proved the fastest and most reliable operators.

* * *

Meeting of New York Chapter of American Society of Tool Engineers

The Greater New York Chapter of the American Society of Tool Engineers will meet on November 5 at 8 P.M. in the North Ball Room of the Hotel New Yorker. During the technical session, Edwin Weiss, chief engineer of the Milwaukee Metal Spinning Co., will speak on "Modern Methods of Metal Spinning."

Re-Employment of Veterans

Since there is a great deal of uncertainty as to the exact requirements of the law with regard to the re-employment of returning veterans, the Information Service of the Selective Service System has issued several statements clarifying important points.

It is emphasized that the law provides that the veteran is entitled to reinstatement in the job he left to enter service or in one of like seniority, status, and pay, if the position was with a private employer or the Federal government, its territories or possessions, or the District of Columbia; if the position was other than temporary; if the veteran applies for reinstatement within ninety days after separation and has a certificate of "satisfactory completion of his training and service"; and if the circumstances of the employer (if a private employer) "have not so changed as to make it unreasonable or impossible" to restore him to the job.

After he is restored to the position, the veteran may not be discharged without cause within a year. In addition, he is entitled to restoration without loss of seniority and shall be considered as having been on furlough or leave of absence during his period of service. He also is entitled to participate in insurance or other benefits "offered by the employer pursuant to established rules and practices relating to employes on furlough or leave of absence in effect with the employer at the time such person entered military or naval service."

The question is often raised: What should an employer do in case the position formerly held by the returning veteran is now filled satisfactorily by someone else? Is he obliged to discharge the more recent employe? According to a statement made by the Selective Service System, this may become necessary, because the clause relating to the reinstatement of veterans applies only to the employer and "consequences to third parties are not involved." The clause "cannot be applied to cover the effect of restoration of the veteran on persons such as other employes."

Another interpretation reads: "When two or more veterans with restoration rights had, as an element of their former positions, the same job assignment, the right of each veteran to be retained in that job assignment is subject to the right of the other veterans who before entering active military service were prior holders of that job assignment."

These Selective Service statements are included in a new handbook containing re-employment provisions of the Selective Training and Service Act. This handbook can be obtained from the National Headquarters of the Selective Service System, 21st and C Sts., N.W., Washington 25, D. C.

Stack-Cutting Provides Fabricating Short-Cuts

STACK-CUTTING with an oxy-acetylene flame-cutting machine often shows an impressive saving in production time and cost compared with the use of dies for stamping out similar shapes on a press. Successful machine cutting of stacked sheets is largely dependent upon the care used in preparing and setting up the work. It is especially essential that the sheets be held tightly together along the lines of the cuts to be made.

In the plant of the Wellman Engineering Co., Cleveland, Ohio, where the production of special shapes in large quantities from thin steel sheets is speeded up by stack-cutting with an Airco No. 30 Travograph flame-cutting machine, special clamps that are designed to maintain pressure in all areas adjacent to the cut lines are used in some cases. For many shapes, however, it has been found that a more flexible and convenient method is to use heavy bolts instead of clamps.

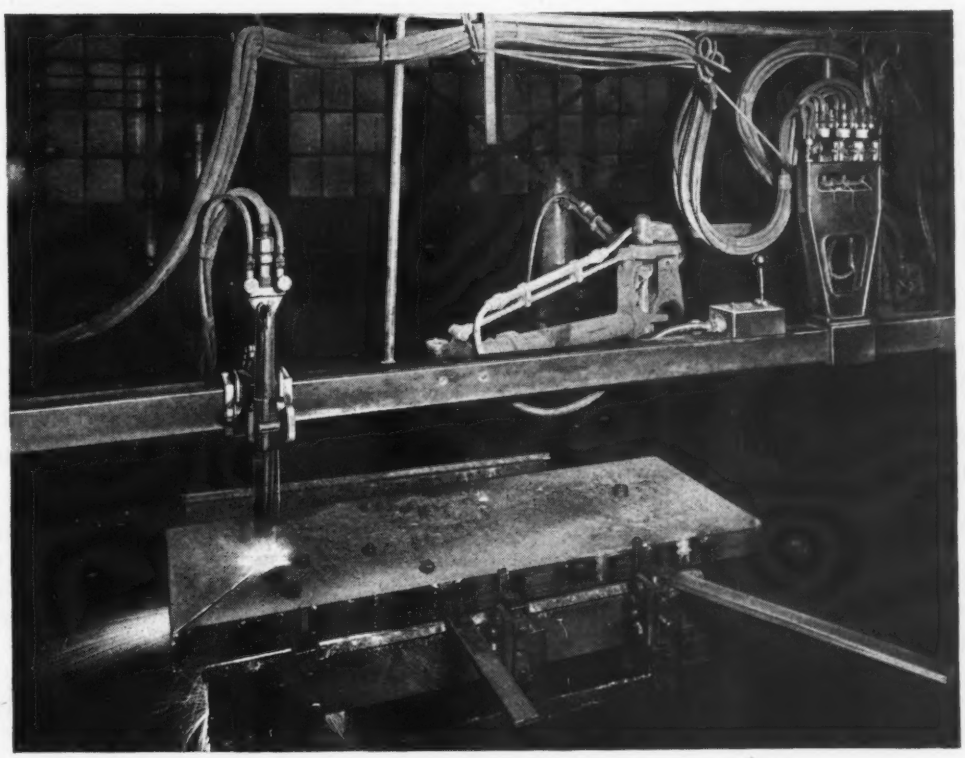
A stack of sheets that has been set up by the use of bolts for simultaneous flame-cutting is shown in Fig. 1. This stack comprises twenty pieces of 1/8-inch thick low-carbon steel topped by a "waste" plate 3/16 inch thick. The waste plate prevents the preheating flame from overmelting the edges of the sheets nearest the top. After the stack of sheets is squared up and clamped tightly together, the arc-welding process is used to run a series of light beads vertically across the edges of the sheets, all around the stack, at intervals of about 4 inches, as seen in the illustration. This serves the purpose of holding the sheets in position until the flame cuts have been made. A master templet the exact shape of the pieces to be cut is then placed on the stack and holes to be drilled for the fastening bolts are laid out. Then, the bolt holes are drilled and the stack of sheets is bolted tightly together.

The master templet is seen in place in Fig. 1. Before flame-cutting is started, the operator moves the torch head over all the cutting lines of the templet to make certain that nothing will interfere with the progress of the operation

Fig. 1. An Airco Travograph Flame-cutting Machine Set up for Cutting Operations on a Stack of Sheets which have been Bolted and Arc-welded together to Prevent Shifting during Cutting

Fig. 2. The Movement of the Torch Head in Flame-cutting Stacks of Steel Sheets is Controlled by a Magnetic Wheel that is Operated in Contact with the Templet Here Seen Mounted on the Adjustable Table

Fig. 3. For the Actual Flame-cutting Operation on a Stack of Sheets, the Master Templet Seen in Fig. 1 is Removed, as the Operation is Controlled from the Templet Shown in Fig. 2



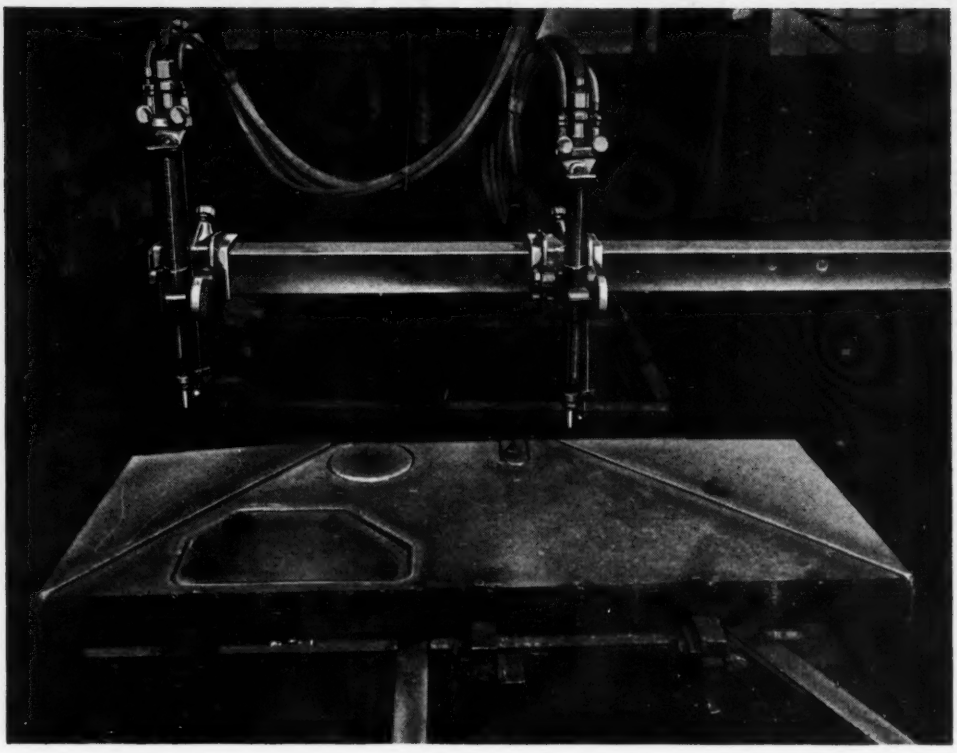


Fig. 4. A Stack of Sheets at the End of a Flame-cutting Operation. The Rough Sketch on the Waste Piece at the Left Indicates how This Excess Material will be Used in the Production of a Smaller Shape

after it has been once started. The path of the various cuts is controlled by the contact of a magnetic wheel with the templet seen in Fig. 2. This templet is mounted on a movable table top actuated by a handwheel, so that the templet can be accurately lined up with the sheets.

In the case illustrated, the first cuts made are at the ends of the sheets. One of these cuts is seen in progress in Fig. 3. After all the cuts that can be started from the edges of the stack have been finished, the interior cuts are made. In making any one of the interior cuts, a bolt is removed to provide a starting point for the flame. It will be noted that the bolts are spaced so as to prevent any separation of the sheets as the cuts are made.

All cuts on the sheets are seen completed in Fig. 4. When the bolts are removed, it is a very easy matter to separate the sheets. If proper care has been taken to prevent any separation during the cutting period, the pieces will be uniform in size and the edges of the sheets will be as smooth as shear cuts.

The rough sketch seen on the triangular waste segment at the left end of the stack is an indication that this piece, which otherwise might be wasted, will be used in cutting out another shape for which templets have been prepared. The racks seen in the background of Fig. 1, contain many templets for small parts that are needed from time to time. It is possible to salvage a great deal of scrap in stack-cutting by using the left-over material for the production of these miscellaneous small parts. With the sheet material already stacked on the table and fastened, and templets right beside the machine, it takes only a few minutes to get started on a small part after finishing an operation on larger pieces.

The flame-cutting machine department is located on the third floor of the Wellman plant. Oxygen is supplied from a bulk oxygen trailer to a central control manifold in the control room on the first floor and then conducted by pipe line to the third floor. The fuel gas is compressed acetylene supplied from cylinders.

* * *

War Production Board Specialists Available to Private Industry

Specialists in the machinery field who have been serving the War Production Board are now available to private industry. The end of the war has terminated many of the board's activities and thus made possible the release of these specialists. Employers desiring to interview machinery specialists may do so by writing to the Regional Director, War Production Board, Empire State Bldg., New York 1, N. Y.

Clearing up a Misconception in the Employment of Discharged Veterans

By C. CHARLES BURLINGAME, M.D.
Psychiatrist-in-Chief, The Institute of Living, Hartford, Conn.
Associate in Psychiatry, Columbia University
Chairman, Sub-Committee on Psychiatry of the NAM Medical Advisory Committee

WHAT are the practical implications of the term "neuropsychiatric," which has been applied to so many discharged veterans? In order to answer this question, I am expressing the following opinions as one of three psychiatrists to whom has been posed the very important problem of the effect on industry of releasing into civilian pursuits supposedly vast numbers of neuropsychiatric cases discharged from the armed forces.

We have been requested to make suggestions concerning what should be done with the so-called neuropsychiatric dischargees whom industry is expected to employ or re-employ. It has been assumed that this problem is one separate and distinct from all other problems concerning post-war industry. I am happy to be able to report that, as a result of an extensive survey of various industrial organizations, this problem is not as serious as the layman may have imagined.

By way of introduction, perhaps it would be well to state that the term "psychoneurosis" does not designate a disease in the sense that pneumonia, typhoid, and malaria do. The term "psychoneurotic" is more of a social diagnosis. It affects the individual relationship of all people to other people in their homes, in their employment, and in their social environment. A psychoneurotic requires an adjustment, as an individual, to his environment and occupation. Briefly, psychoneurosis may be defined as an emotional upset developed to the point where it interferes with the individual's efforts in his employment or with his domestic life or social relationships. Everyone, at one time or another, and in varying degree, exhibits such symptoms.

Obviously, the adjustment to military life for a man established in peaceful pursuits and relationships greatly affects his emotional life. If he fails in any of the required adjustments, he is discharged as a psychoneurotic. In civilian life, the same man might make a very satisfactory adjustment to his employment relationship and be an extremely valuable employe. The effort to make the necessary adjustments to military life may have caused increased irritability, seeming indifference, or other traits indicating a lack of the usual sustained and normal interests. These symptoms tend to disappear more or less automatically as the individual's war experience recedes in point of time.

Abnormal sensitivity to sound and an abnormal acuteness of hearing frequently call for special consideration. Again these symptoms are transitory, and need not become the basis of any permanent difficulty in connection with peacetime employment.

The sum and substance of all this is that we need pay little or no attention to whether or not a man was discharged from the armed forces as a psychoneurotic. This term, as a basis for discharge from the armed forces, amounts to nothing more than saying that he did not have the personal traits that enabled him to become a satisfactory member of the armed forces. The inability of a man to adjust himself to military life and conditions does not imply inability to make a satisfactory adjustment to industrial or business occupations. Unfortunately, the term "psychoneurotic," which has been used as a label for this entire group, has been greatly misunderstood by manufacturers and others in civilian life.

Throughout industry there are thousands of psychoneurotic people being successfully employed. In the past, it may have been found that they were not suited to some particular job, but were quite satisfactory in another position. They were never ruled out as undesirable for employment. There is no more reason to look upon the discharged veteran in that light. If emotionally upset through his war service, the return to normal conditions will soon restore him to his normal frame of mind.

I could dwell at length upon the observations upon which these conclusions are based, but one reference will be sufficient. In one large plant, employing tens of thousands of men, returned veterans are being hired without regard to the circumstances surrounding their discharge from the armed forces; the sole basis for employment is the veteran's past training and skill. No attention whatever is paid to whether he was discharged as a psychoneurotic.

After a period of months of employment, the work record of these veterans was compared with that of non-veteran groups. It is of interest to note that nearly one-third of the veterans rated higher in productivity than the average for the entire plant; and a little over one-third of these veterans had developed higher skills than they possessed before they entered the armed forces.

Furthermore, there seemed to be no connection whatever between the success or failure in industrial work between the veterans discharged for neuropsychiatric reasons and those discharged by the armed forces for other reasons. Hence, I am forced to the conclusion that the presence or absence of psychoneurosis as a discharge factor in the armed forces has no bearing whatsoever on re-employability.

Mechanical Engineers Meet in Cincinnati

A MEETING of the Cincinnati section of the American Society of Mechanical Engineers was held at the Hotel Netherland Plaza in Cincinnati on October 2 and 3. The meeting had originally been scheduled as the regular fall meeting of the Society, but owing to the restrictions on conventions, now removed, it was necessary to plan the meeting as a section gathering. However, the number of sessions held, the diversity of subjects dealt with, and the well attended meetings had all the characteristics of a complete Society meeting.

As might be expected in a machine tool center like Cincinnati, emphasis was given to metal-cutting and production engineering subjects, but in addition, there were sessions devoted to plastics, management, applied mechanics, fuels, aviation, railroad engineering, and education and training.

Management, Education, and Training

Two management sessions were held, at which papers were read on "Methods Engineering in Post-War," by Stewart M. Lowry, vice-president of Methods Engineering Council, Pittsburgh, Pa.; "Planning for a Better America—the Program of the Committee for Economic Development," by Millard Romaine, assistant to president of the Cincinnati Milling Machine Co., Cincinnati, Ohio; "The Impending Scarcity of Scientific Personnel," by M. H. Trytten, director of Office of Scientific Personnel, National Research Council, Washington, D. C.; and "How Can the Universities Meet the Shortage of Scientific Personnel?" by Raymond Walters, president of the University of Cincinnati.

The education and training session was planned as a memorial session to Dean Herman Schneider, who originated the cooperative engineering courses at the University of Cincinnati. At this session, papers were read on the "Origin and Development of the Cooperative Courses at the University of Cincinnati," by Clyde W. Park, professor of English at Engineering College, University of Cincinnati; "Cooperative Courses in Technical Institutes," by John T. Faig, president of Ohio Mechanics Institute, Cincinnati, Ohio; and "Industry's Opinion of Cooperative Courses," by W. W. Tangeman, vice-president of the Cincinnati Milling Machine Co.

Metal-Cutting Sessions

As already mentioned, metal cutting was given a prominent place on the program. No less than four separate sessions were held devoted to this and allied subjects. The following papers were presented during these sessions: "Face-Milling of Cast Iron," by O. W. Boston, professor, and W. W. Gilbert, associate professor, Department of Metal Processing, University of Michigan, Ann Arbor, Mich.; "Data on Production Runs with Carbide Milling Cutters," by A. O. Schmidt, research engineer of Kearney & Trecker Corporation, Milwaukee, Wis.; "Speed and Feed Selection in Carbide Milling with Respect to Production, Cost, and Accuracy," by Hans Ernst, research director of the Cincinnati Milling Machine Co., and Michael Field, research fellow of University of Cincinnati; "The Rounding Effect in Centerless Grinding," by Albert H. Dall, assistant research director of the Cincinnati Milling Machine Co.; "Cutting Fluids: An Appraisal and an Apology," by W. H. Oldacre, president and general manager of the D. A. Stuart Oil Co., Ltd., Chicago, Ill.; "Single-Point Turning Research—Equipment and Methods Involved," by Joseph F. Allen, project engineer of Warner & Swasey Co., Cleveland, Ohio; "Nomographs for Analysis of Metal-Cutting Processes," by M. E. Merchant, physicist, and Norman Zlatin, research engineer of the Cincinnati Milling Machine Co.; "Some Effects of Work Positioning when Face-Milling Steel," by Fred W. Lucht, development engineer of the Carboloy Company, Detroit, Mich.; "Analysis of Initial Contact of Milling Cutter and Work in Relation to Tool Life," by M. Kronenberg, research engineer of the Cincinnati Milling Machine Co.; and "Experience with Carbide-Tipped Tools," by M. E. Feldstein, general superintendent, Indirect Manufacturing Department, Delco Products Co., Dayton, Ohio.

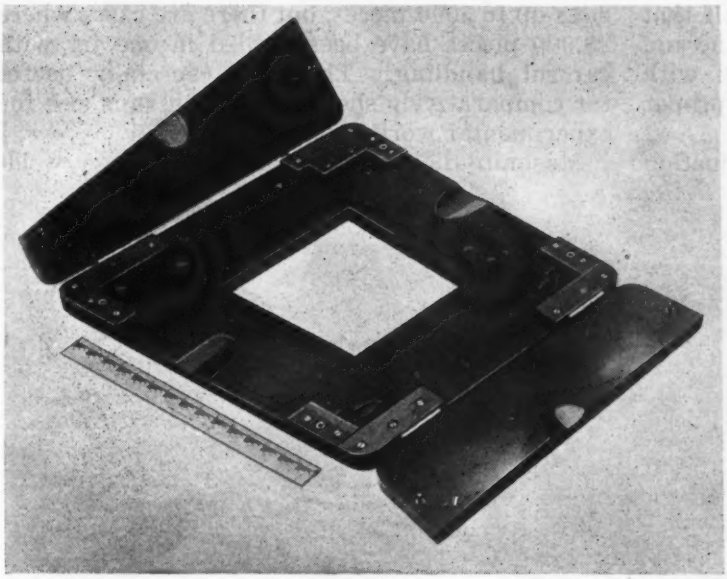


Fig. 1. Hinged Type of Drill Jig Made from Masonite Die Stock—a Non-metallic Material

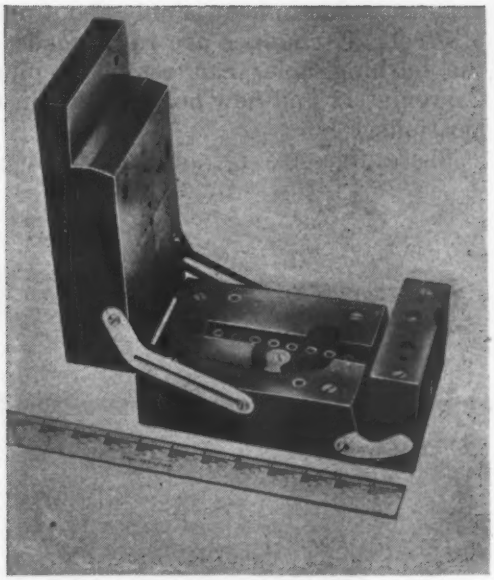


Fig. 2. Another Example of Hinged Type Masonite Die Stock Drill Jig

Masonite Die Stock Used for Drill Jigs

MASONITE die stock, so widely used during the last few years for die work in aircraft and other industries, is now being used to a considerable extent for drill jigs, replacing steel and cast iron. The Masonite die stock is used in exactly the same manner as metal. Unserrated steel drill bushings are inserted in the die stock with a press or drive fit. The holes in the Masonite die stock are drilled 0.003 inch under size for this purpose.

The accompanying illustrations show different types of drill jigs constructed from Masonite die stock, indicating what has been accomplished along these lines up to the present time. Fig. 1 shows a hinged drill jig for drilling a number of holes in an aircraft part. It will be noted that this jig is constructed in much the same manner as if it had been made from metal. Nevertheless, it weighs only about one-sixth of what it would have if made from steel or cast iron, and it can be machined in one-tenth of the time required for steel. The machining can be done either with woodworking tools or with regular machine tools.

On an average, the cost of the jig body is only about 20 per cent of what it would be if made from metal. The jig bushings can be located within limits of plus or minus 0.002 inch. It is important to note that the Masonite die stock is not affected by average climatic changes, so that the hole locations may be depended upon to retain their original accuracy. Its coefficient of

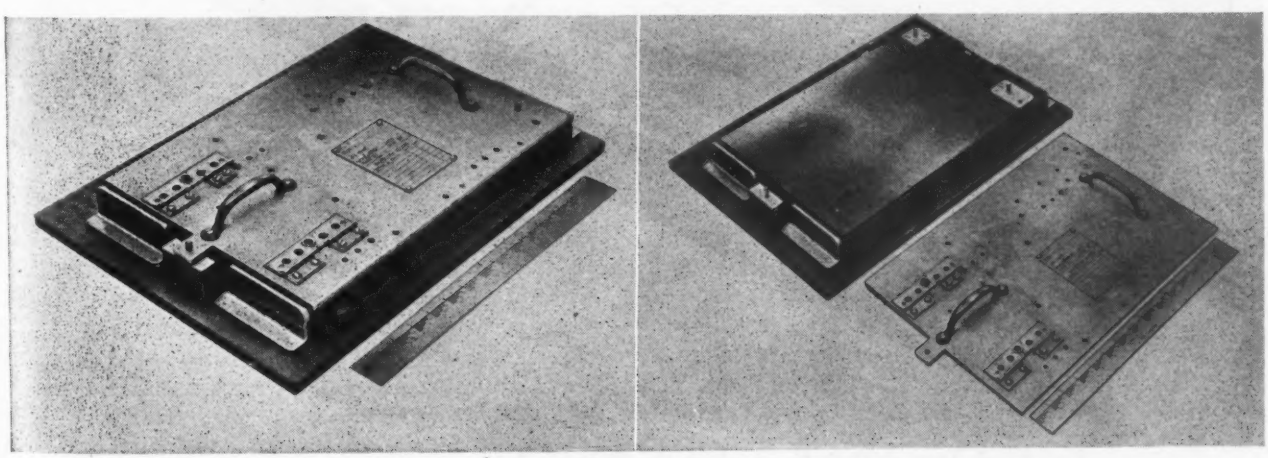


Fig. 3. Cover Plate Drill Jig for Flat Stock, Shown with Cover in Place and Removed

expansion due to heat is only about one-half that of steel. If changes are to be made in the jig, the bushing holes can easily be plugged with Cerromatrix and new holes drilled in the proper locations.

These jigs are recommended for production runs up to 5000 pieces, but there are cases where 20,000 pieces have been drilled in one jig with careful handling. They are especially useful for comparatively short production runs and for experimental work.

Masonite die stock can also be used for weld-

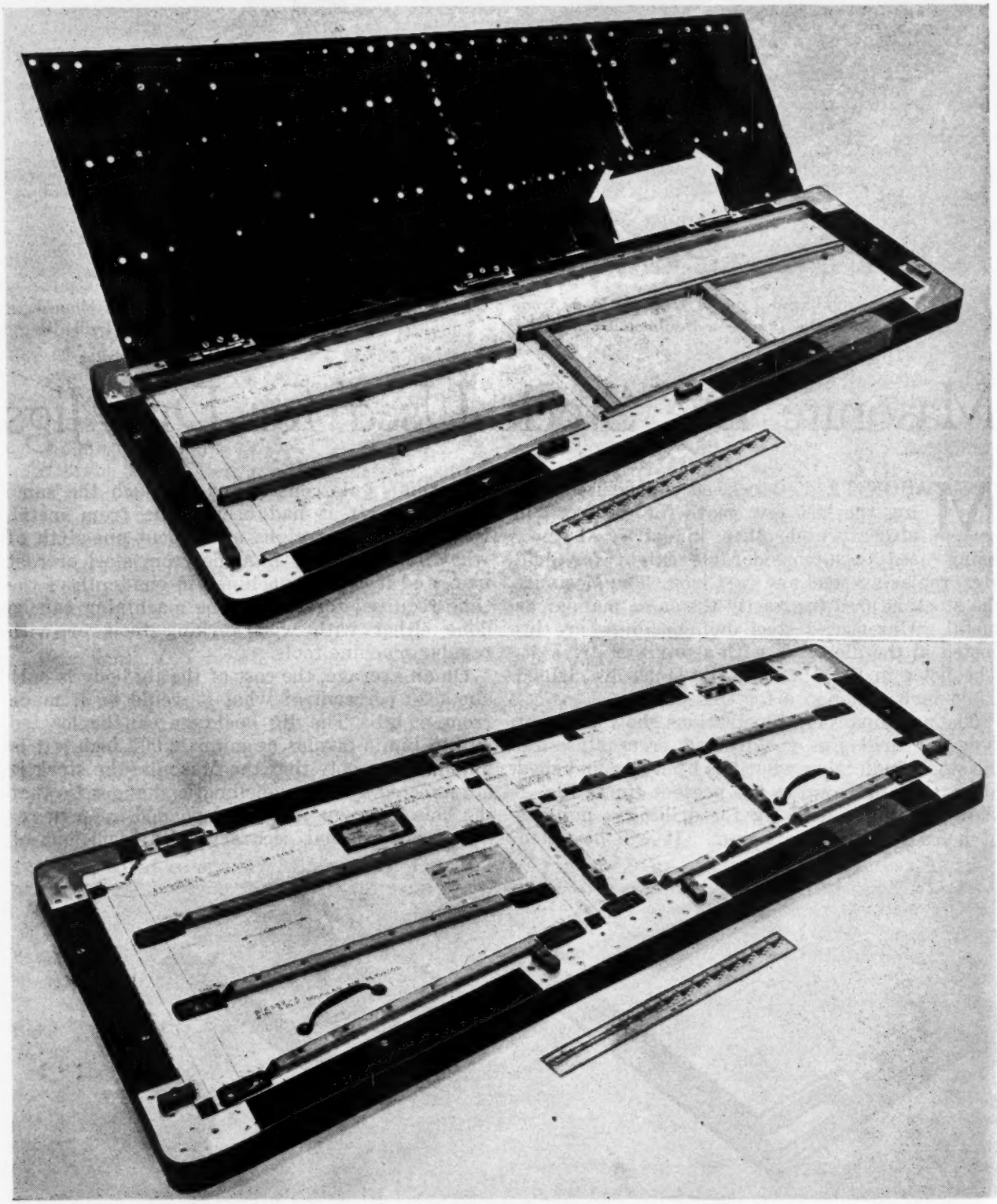


Fig. 4. A Type of Drill Jig in which the Masonite Surface has been Sensitized for Photographic Reproduction of Instructions for the Operator

ing jigs, provided the construction is such that the welding flame does not come in direct contact with the material. Welding jigs may be protected from the flame in one of two ways: First, they may be constructed in such a manner that the torch flame blows by the Masonite surfaces—that is, the material to be welded is supported at each end by the die stock, and an opening is provided for the flame to pass between the die stock supports, so as not to come in direct contact with them; and second, the die stock may be protected by a shield of thin-gage metal placed about 1/8 inch away from the surface of the die stock.

Masonite die stock can be drilled and tapped the same as metal. Jigs made from this material can be stored away for years without any change in their dimensions, since the material is not affected by average storage conditions.

Fig. 2 shows another jig of the hinged type intended for flat work; Fig. 3 shows a jig of the removable-cover type, also suitable for flat work; and Fig. 4 shows quite an elaborate jig which is provided with a hinged cover. The jig shown in Fig. 4 illustrates another advantage of Masonite die stock. The material can be sensitized and instructions can be photographed directly on the surface of the die stock. In this case, complete information as to drill sizes and use and application of the jig are thus provided for the operator. Fig. 5 shows how Masonite die stock is used in the construction of a milling fixture, the design being much the same as if metal had been employed.

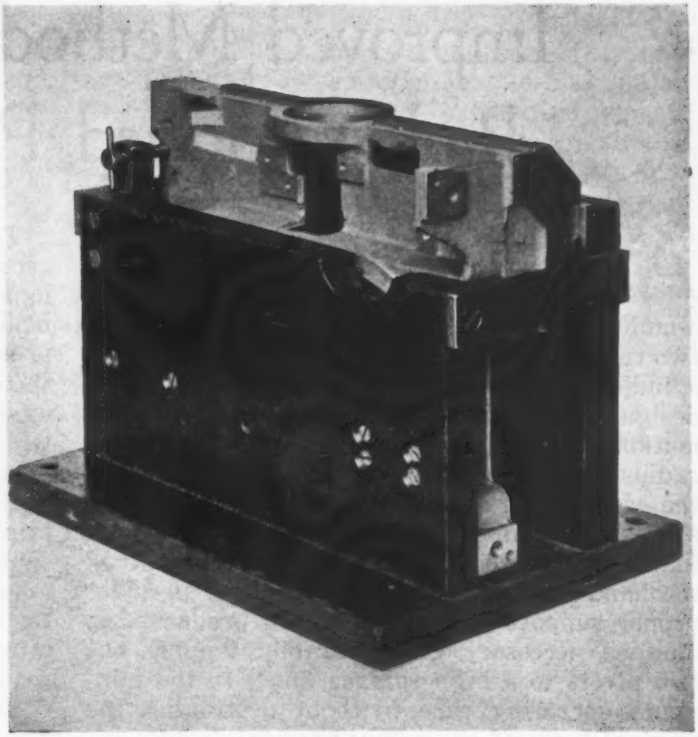


Fig. 5. A Milling Fixture Built up from Masonite Die Stock

Obviously, one of the important features of tools of this kind is their light weight. They can be easily handled, even by women workers, and conveniently moved from machine to machine if necessary. Masonite die stock is made by the Masonite Corporation, 111 W. Washington St., Chicago 2, Ill. The material is available in sheet form, measuring 4 by 6 feet and 4 by 12 feet, with thicknesses ranging from 1/4 inch up to 2 inches.

Vibration Test Table Used to Shake Out Faults of New Designs

WHAT is known as a vibration test table which is used for submitting newly designed products to vibration similar to that which may be met with in the use of the product, has been placed on the market by the L.A.B. Corporation, Summit, N. J. A large table top is supported by four vertical rods which permit the table to vibrate in two horizontal directions. Both the amplitude and the direction of vibration of the table are adjustable. The frequency range is from 10 to 60 cycles per second. The equipment has a maximum capacity for testing assemblies weighing up to 400 pounds. Installations can be made without concrete bases on the upper floors of buildings.

It is stated that these vibration test tables speed up corrections of design and manufacturing errors, avoiding expensive and time-consuming field tests. By their use, weaknesses that might show up after installation in the customer's plant are detected before shipping.

* * *

At the meeting held in Buffalo, N. Y., October 4 and 5 by the board of directors of the National Tool and Die Manufacturers Association, it was announced that the Association now has over 400 members in the various tool manufacturing centers of the country.

Improved Methods for Lapping Radius-Formed Pivot Bearings

AN interesting machine developed recently at the East Springfield, Mass., Works of the Westinghouse Electric Corporation, for simultaneously and automatically lapping the two radius-formed supporting pivots of a wheel-spindle, is shown in Fig. 1. This machine is designed to duplicate by mechanical means the motions previously employed in hand-lapping radius-formed pivots on wheel *W*, which have the same shape as the end of the punch shown at *A*, Fig. 2, and at the same time to eliminate inaccuracies which could not be avoided when the hand-lapping method was used. It provides proper support for the work and produces the motions necessary for accurately lapping the two pivots to a high surface finish in the minimum operating time, without destroying the original form of the radius-ground pivots.

The development of the lapping machine was accompanied by a change from the cast-iron laps used in hand-lapping to soft babbitt laps, made as illustrated in Fig. 2. The babbitt lap is rough-machined to shape and then placed in the die, where it is formed to the required shape by the accurately machined end of the punch, which is an exact duplicate of the wheel-support pivot to be lapped. This method of producing the laps simplifies the problem of obtaining extreme dimensional accuracy in the contour of the pivot, since it is much easier to machine the external surface of the punch to the required accuracy than it is to machine the internal surface of the lap to the exact contour required.

This coining die method of producing the laps also has the advantage that the punch and die can be used to recoin the lap without destroying the compound-loaded condition of the lapping surfaces. This reconditioning of the laps gives them a long life, and when they can no longer be reshaped, they are melted and recast to form new laps.

In operating the machine, the wheel *W*, Fig. 1, with pivots to be lapped, is placed in the position shown, where it is prevented from moving horizontally by rollers located in the rigid center post *B*. Two cast-babbitt laps *C* and *D*, which have been accurately sized in the coining die, support the wheel on its pivots. Thus, the wheel is free to rotate, but can have no endwise movement. The laps are located in cam supports *E*, mounted on a shaft *F*, which is equipped with eccentric collars. These collars impart a reciprocating motion to the laps when shaft *F* is rotated by the motor *G* through the gear reduction drive.

Rotation of the wheel *W* during the lapping operation is effected by swinging the arm carrying the pulleys and belt *H* downward, so that the wheel is driven by the belt.

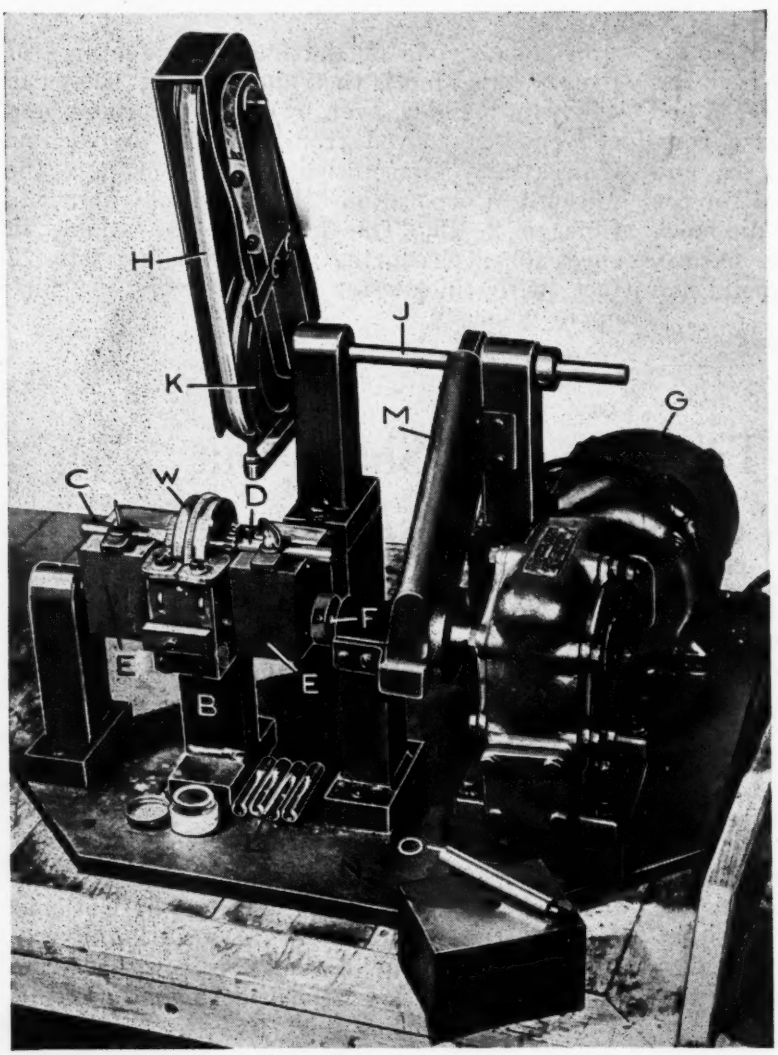


Fig. 1. Equipment Designed for Lapping Pivot Bearings Having Form Shown at A, Fig. 2

Shaft *J*, on which the belt-driving pulley *K* is mounted, is, in turn, driven from shaft *F* by a sprocket chain enclosed by guard *M*.

Referring to the laps shown at *L*, which are not in use, it will be noted that a slot is milled in one side. When the laps are in place, as at *C* and *D*, the slots are located on the top side to receive the lapping compound. The die and punch used in forming the babbitt laps are shown at *N* and *O*, respectively. With the wheel rotating and the laps reciprocating sufficiently to permit a good distribution of the lapping compound, the radius-formed pivots are quickly and uniformly lapped to a high surface finish.

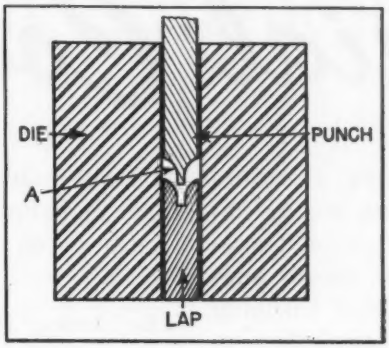


Fig 2. Die and Punch Used in Producing Soft Babbitt Laps for Pivot Bearings of a Wheel-spindle

* * *

Special Fixture for Turning and Boring a Ring-Shaped Part

The ring-shaped plunger *A* and the cylinder *C* shown in Fig. 1 are machined from small brass castings, the hole in cylinder *C* being cored. The curved cylindrical plunger *A* is finished by turning, and the cored hole in cylinder *C* is finished by boring. It is necessary that both the plunger and cylinder be finished to size within close limits. The diameter of the cylinder is 13/16 inch, and the radius of curvature on the center line is exactly 1 inch.

The fixture described and illustrated in this article was devised to perform both the turning and boring operations mentioned. The fixture was first used as shown in Figs. 2 and 3 to facilitate turning the boring-bar *G*, which was subsequently used for boring the cylinder *C*, as indicated in Fig. 4.

The boring-bar *G* is a mild steel forging shaped to clear the holder *D* and mounted on the shaft *O*. It is clear that when the faceplate rotates and *G* is fed slowly in a circular path by a worm and wheel, the rotating cutter *E* will form the bar to a true cylinder shape with a curved axis of circular form, provided, of course, that the point of the cutter and the axis of shaft *O* lie in a plane that intersects the center line of the lathe spindle at right angles. The final position of boring-bar *G*, when completely turned, is shown dotted in Fig. 2.

The hole for the fly-cutter holder *H* is then made. To do this, boring-bar *G* is returned to its original position, shaft *O* is locked, and bar *G* is fed into a drill held in the lathe mandrel, the feed action being obtained by traversing the lathe carriage toward the headstock. A single-point boring-bar is then used to finish the hole in a similar manner. Next, the end of bar *G* is spot-faced so that the cutter *J* will rotate in a plane radial with the axis of *O*. The final operations in making the boring-bar consist in milling a U-shaped slot for the flexible shaft *M* and a recess for the spur gears *K* and *L*. For turning the plunger *A*, the boring-bar is removed and replaced by the plunger.

Boring of the cylinder *C* is carried out by the boring-bar and fixture arranged as in Fig. 4. In this case, the boring-bar is mounted on the face of an angle bracket (not shown). The power for boring is obtained from the lathe by gripping the end of the flexible shaft *M* in a drill chuck held in the lathe mandrel.

* * *

The American Management Association, 330 W. 42nd St., New York, held a production conference at the Palmer House, Chicago, Ill., October 29 and 30, at which production policies, compensation, labor's attitude to cost reduction programs, and cost control, were discussed.

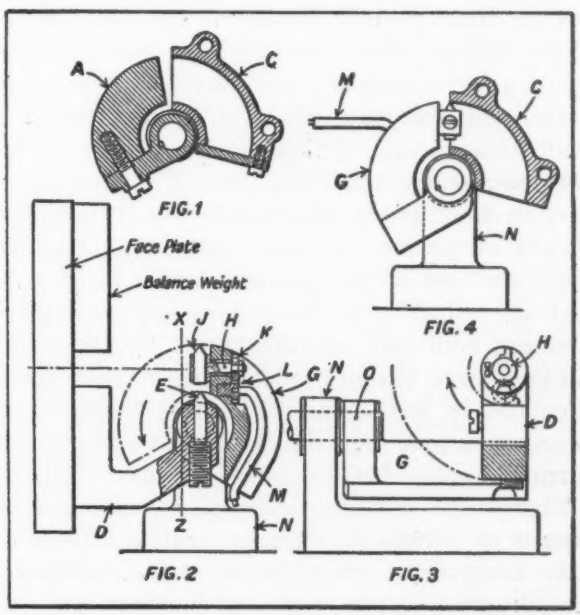


Fig. 1. Ring-shaped Plunger A and Cylinder C Machined by Turning and Boring Fixture Shown in Figs. 2, 3, and 4. Fig. 2. Lathe Fixture Set up with Tool E for Turning Boring-bar G of Special Ring-boring Fixture which is Equipped with Tool J Driven by the Flexible Shaft M. Fig. 3. Cross-section X-Z, Fig. 2. Fig. 4. Special Fixture Set up for Boring Hole in Cylinder C

Editorial Comment

The recent strike of the elevator operators in New York City, where elevators are as important and indispensable a means of transportation as subways, trolleys, or buses, suggests the necessity for some rational thinking and the need for common-sense legislation to prevent uncalled-for breakdowns in our business and manufacturing activities.

It does not speak well for the degree of perfection of our social organization when a few thousand men are at liberty to throw hundreds of thousands of people out of work and to seriously interfere with the well-being and activities of millions. It is still less creditable to our social organization and to our lawmakers that a handful of labor organization leaders, who have no regard for the public welfare, are permitted legally to wield such great power. It seems incredible that the American people will consent in the long run to submit to this kind of tyranny of union leaders.

There Are Limitations Even to the Right to Strike

Every fair-minded man recognizes that men have a right to join in unions for the purpose of furthering their own best interests, just as much as professional men have to join in societies, and business men and manufacturers in trade associations. Unions of working men have been necessary and have played an important part in raising the standard of living of large groups of people; but this fact in no way excuses the use of the power of unions in ways that are contrary to the public welfare. When business men and manufacturers try to obtain undue power through monopolies, their power is curbed by law. The same rules should apply to any group of men that tries to wield a power harmful to the best interests of other citizens.

There are certain occupations and certain groups of people to whom a truly civilized society must deny the right to strike, because a conspiracy to cease work on the part of these groups endangers, or interferes seriously with, the rights and welfare of the great majority. If that is not so, there is no meaning to the expression "the greatest good for the greatest number."

It is obvious to anyone that the men in the Army and the Navy cannot be permitted to go on strike. It is equally obvious that the police force and the firemen in our cities must not be free to go on strike. However, the workers engaged in providing the community with electric light and power, gas, water, telephone and telegraph service, and transportation (horizontal or vertical!) are equally necessary to the functioning of civilized life. Hence, men engaged in such occupations should not be free to impose their will upon the majority at the caprice of a few leaders, and there should be legal recognition of this fact, with appropriate penalties. When men engaged in such occupations go on strike, it is a conspiracy against the welfare of the public.

The Army, the Navy, and the Police Force Do Not Go on Strike

Obviously, individual men can quit their work if they are dissatisfied; but certainly it is contrary to sensible public policy to permit men in such vital occupations to conspire with one another to quit rendering service, with the expectation of being reinstated when their demands have been met.

It is surprising that the fact has not been generally recognized that those who render public service, whether as owners, managers, or workers, are in a different class from those who are engaged in individual manufacturing enterprises. The owners of water works, electric power plants, and means of transportation, for example, have to obtain Government franchises and must operate under governmental regulations; should they stop functioning, the Government would take over, because the stoppage of such services cannot be tolerated. Likewise, the workers in those enterprises, by the mere fact that they seek jobs of that character, assume a public duty and must relinquish certain prerogatives that other workers retain.

Rights of the Public also Need Some Recognition

It is to be hoped that strikes of the type that recently tied up a very large number of the office buildings in New York City will prove to be a sufficient object lesson to the patient and long-suffering American people to result in their taking steps to remedy an evil that has too long been permitted to flourish.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Mechanisms Used in Machining Contours and Profiles

The machining of metal surfaces to contours that duplicate those of a master part or templet by employing a pantograph or other type of copying mechanism has made possible tremendous savings in time and machining costs. Such machines, for example, have made possible the economical manufacture of many plastic products which otherwise would never have been placed on the market because of the cost of producing the dies or molds by hand.

In view of the increasing use of die-sinking and contour forming machines, the copying mechanisms employed in their design are of especial interest. In an article recently published in *Machinery* (London), H. C. Town described the mechanisms shown in the accompanying illustrations, noting that until comparatively recent times a considerable amount of hand work was employed for the finishing of dies and molds after preliminary roughing by shaping or milling operations.

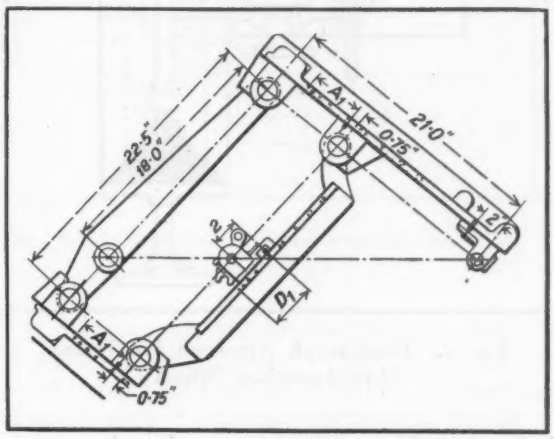


Fig. 2. Pantograph Mechanism of Form-milling and Die-sinking Machine

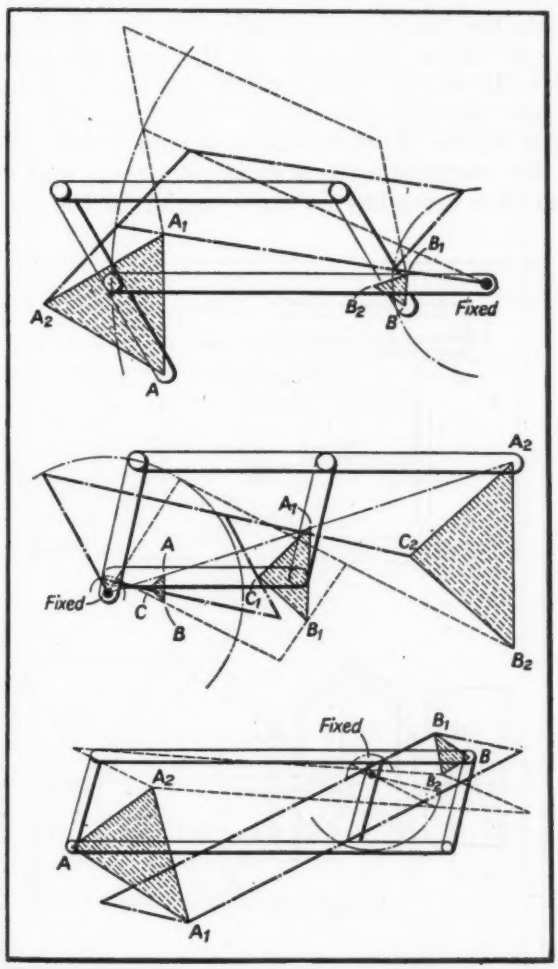


Fig. 1. Alternative Arrangements of Pantograph Linkage Mechanisms

It is of interest to note in this connection that before the advent of any machine tools for this purpose, James Watt, in 1810, at the age of seventy-four, spent his last years in copying elaborate statuary with a machine of his own invention. The principle on which the machine operated was that of two arms or hands, one of which traced the contour of the pattern while the other, carrying a cutter, machined the work to the same size and form as the pattern or to any reduced scale desired. From Watt's invention, it was only logical that the present-day pantograph should be developed.

Probably the best known example of a pantograph mechanism is that applied to engraving machines. The same principle, however, is also applied extensively in forming profile grinding wheels.

Referring to the three types of linkages shown in Fig. 1, it will be seen that by rotating the frame around a fixed point while keeping the tracer point in contact with the larger triangle

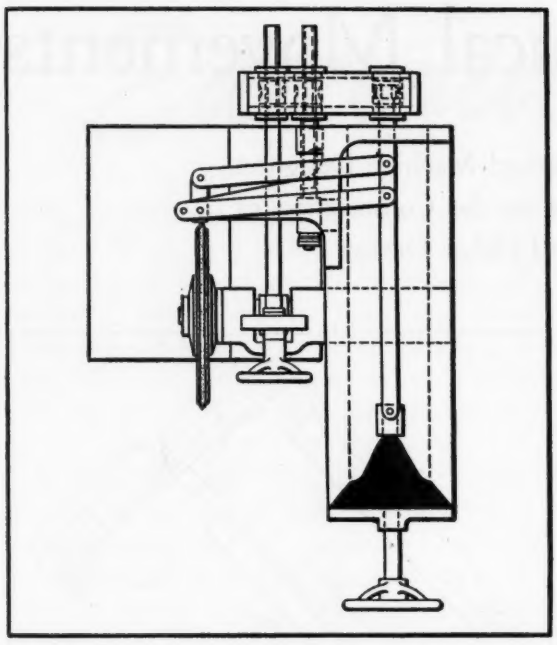


Fig. 3. Pantograph Arranged for Truing Thread-grinding Wheel

AA_1A_2 (see top and bottom views), a cutter fixed in another member of the linkage will reproduce the same shape at a reduced scale on the work at BB_1B_2.

In Fig. 2 is shown the pantograph used ρn a Taylor-Hobson milling and die-sinking machine. This can be set to work at any ratio of reduction from 1 1/2 to 1 down to 7 to 1, and is adjusted by setting slides which are pivoted on each end of the pantograph bar so that index lines engraved on them correspond to the graduations on the side bars. For example, if R equals the required reduction, then the distance $A_1 = \frac{21}{R} - 3$ inches, measured from the "7" line; and $D_1 = 15.43 - \frac{18\,(R-1)}{R}$, also measured from the "7" line. Thus the formulas can be used for obtaining any intermediate reduction setting, although the machine can be employed for enlarging, as well as reducing, by merely interchanging the cutter frame and the stylus.

In Fig. 3 is shown the Nuckey Scott patent pantograph for truing thread-grinding wheels of the single-rib type. The diamond and stylus are positioned automatically, and the pantograph always remains parallel to the screw axis, so that the wheel is dressed automatically to the thread form at right angles to the helix. This insures a correct shape, compensation being made for the helix angle by swiveling the wheel-head.

The enlargement is 25 to 1, and when the diamond wears, it is necessary that both diamond and stylus be brought to the same shape, although the exact shape of the diamond is immaterial provided that the stylus follows the same form, enlarged. The pantograph is mounted so that when the diamond is fed into the wheel, the wheel-head is moved to the work by an equal amount, and the wheel grinds to the same diameter after dressing as before.

Pantograph type machines are available for relief work which have a pivot at the table level, so that tracer and tool can be elevated, but such a motion changes the relative position of the tracer and tool in respect to the work and pattern and makes machining difficult. To overcome this drawback, the Deckel design, Fig. 4, utilizes a tilting pantograph system mounted to permit a rocking movement about an axis parallel to the plane of the system, while the tracer and tool are carried by a mechanism that insures that their movements will be parallel with each other. To effect this, they are connected at the tracer and copying points by a pivot in such a manner that movement of the pantograph system about the axis insures that the tool and tracer always move perpendicularly to the work and pattern.

The pantograph arrangement comprises a series of arms A which pivot about the point B, while the main counterbalanced link motion C can be moved vertically on the machine frame. This allows the main tool-carrier bar D to have a free vertical movement. This bar also contains at the opposite end a second tracer point E, for working with a ratio of 1 to 1, and also carries a cross-bar at right angles to the pin B

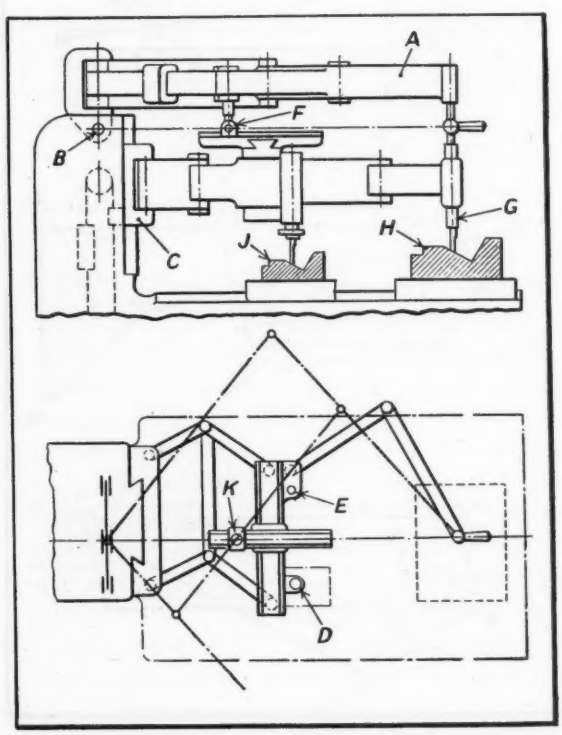


Fig. 4. Tilting Pantograph System Used for Relief Work

with an adjustable slide *F* pivoted to the holder at the copy point.

At the tracer point *G*, the holder can slide in a socket while the handle guides the tracer on pattern *H*. The work is indicated at *J*. For making two copies, a tool can be used at *E* as well as at *D*. For any ratio of reproduction, the work position can remain the same, for when the position of the point *K* is changed, a similar change can be made in the position of the slide *F*. The pantograph system is operated horizontally by the handle and tracer, this movement being transmitted with the required reduction to the tools, while in accordance with the profile of the pattern, the pantograph rotates about the axis *B* to raise or lower the tools. But although the holders *D* and *G* are inclined during the movement, the tools and tracer always remain perpendicular to the work and pattern.

Before the finish cut is taken in profile milling a die or similar part by the pantograph system, it is often necessary to remove a considerable amount of metal from the work, and if roughing and finishing can be performed at one setting, much time can be saved. This is the function of the machine shown in Fig. 5, where a detachable heavy spindle *A* with a multi-tool cutter roughs out a die or similar work. For this operation, the spindle *A* is coupled to the driving mechanism and the spindle *B* is disengaged. The tracer *C* is then brought into a suitable fixed position relative to the tool and to the work and pattern, which are fastened to tables *D* and *E* (or the pattern is placed on table *F* for a 1 to 1 ratio) and brought into proper relative positions horizontally and vertically. Then by turning the handles for the longitudinal and cross traverse, the table *D*, and with it the connected table *E* or *F*, carrying the work and pattern, is given the required movement relative to the fixed cutter. Power drive for the table movements is also available.

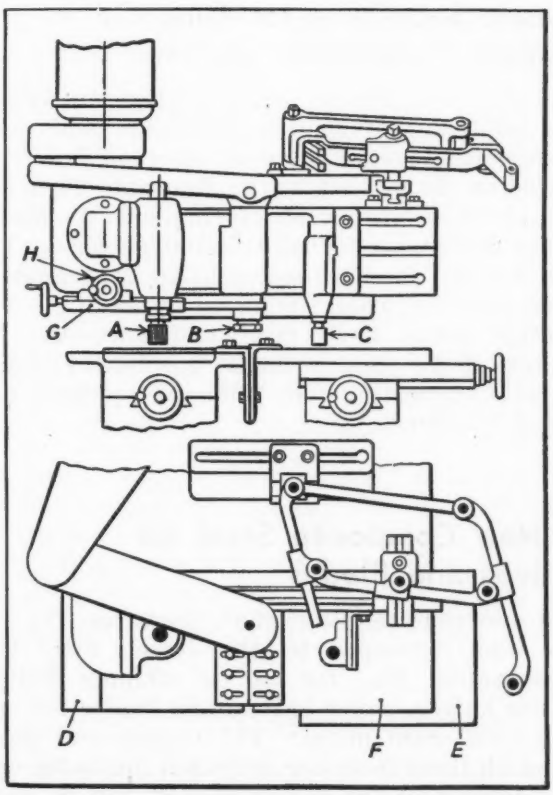


Fig. 5. Pantograph Milling Machine with Duplex Spindles for Roughing and Finishing

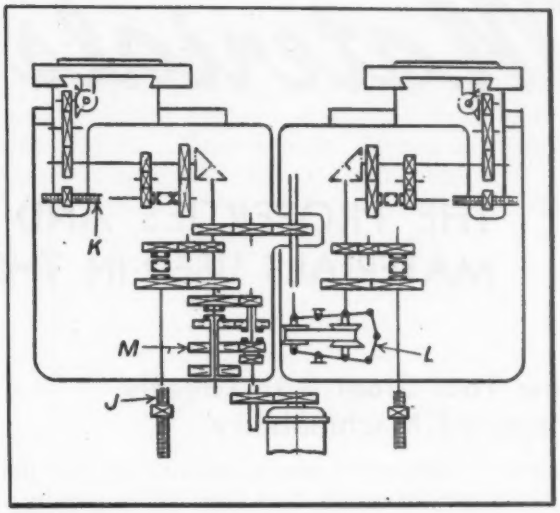


Fig. 6. Mechanism of Duplex-spindle Machine Shown in Fig. 5

After rough-milling, the head is taken off, and the drive connected to the spindle *B* for machining with a single-point tool. All that is required is to move the tracer to the same distance from the tool as for rough machining. The control of the spindle *B* and the tracer relative to the stationary table now takes place through the slides *G* and *H*, or in final finishing operations, through hand control of the pantograph system.

For enlargement or reduction of the work, the tables *D* and *E* are driven at different speeds and are actuated by the gear trains shown in Fig. 6. The left-hand system comprises the motor drive to a six-speed change-gear with connecting gears to the screw *J* for the elevating motion. The drive then extends to a spur-gear reverse on the horizontal shafts to actuate the transverse slide by the screw *K*. Other gears are then connected to the table screw which is fitted with a bevel-gear reverse for the longitudinal traverse.

In order that the two tables may operate either in unison or at varying speeds, the table *E*, Fig. 5, is driven from the mechanism described, but the change-gear device *M* is replaced by an infinitely variable speed unit *L*, so that the ratio of the table movements can be accurately controlled.

Materials of Industry

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

New Tool Steel with Greatly Improved Machinability

Greatly improved machinability is the principal feature of a new tool steel developed by the Allegheny Ludlum Steel Corporation, Brackenridge, Pa. The new steel, known as "Dunkirk EZ," is a free-machining steel especially intended for machined tool-steel parts, such as dies, gages, forming rolls, bushings, liners, and bodies for multiple-edge tipped tools. The free-machining qualities of this steel make it adaptable for tool-steel parts turned out on screw machines and turret lathes, where fast machining properties are of especial value. It is also obvious that the comparative ease with which the new steel is worked makes for longer life of the tools used in machining it.

"Dunkirk EZ" steel hardens to about 65 Rockwell C when oil-quenched from 1450 to 1550 degrees F. It can be tempered up to 500 degrees F. without softening below 60 Rockwell C. It is rather deep-hardening, which assures proper hardness even in large sections, and it undergoes very slight dimensional change in heat-treatment. It is said to possess higher impact and transverse rupture strength than most other oil-hardening tool steels. Another characteristic claimed for this new tool steel is unusual resistance to wear and abrasion.

For special applications, such as for brake dies, this steel can be supplied in the form of bars, blocks, rings, dies, etc., in the normalized condition at from 250 to 275 Brinell, at which hardness good machinability is still obtained. 201

Repair Parts Effectively Protected by Plastic Skin

The use of a plastic dip that gives small machine parts the same protection as the skin of an orange gives to that fruit has made possible the delivery of repair parts in first-class condition in remote overseas sections and in humid climates.

The parts coated in this dip are tied by Fiberglas cord to a conveyor chain which carries them through the plastic dip. They can also be dipped singly by hand. The dip, when cooled, forms a tough, transparent, 0.1-inch thick flexible skin that can easily be peeled off when the part is to be used. The Fiberglas cord is cut off as close to the protective skin as possible.

Glass cord is employed because, if ordinary cotton or linen cord were used, the moisture absorbed by the short length of cord that remains embedded in the plastic skin might cause the part to rust or corrode.

It is estimated that the dip—known as "Eronel Thermodip," and made by Dade Brothers, Inc., Mineola, N. Y.—has resulted in a saving in packaging time of from 60 to 90 per cent; at the same time, large quantities of paper and other packing materials have been saved. . .202

Plastic Substitute for Tung Oil in Sealing Magnesium Castings

A series of plastic thermosetting impregnating solutions for sealing aluminum and magnesium castings in place of tung oil has been placed on the market by the Monsanto Chemical Co., Plastics Division, Springfield 2, Mass., under the name "Thalid X-100" series. The castings are pressure-sealed in an impregnating tank, and the sealant is cured by baking. The sealing resins have good resistance to 100-octane, 40 per cent aromatic gasoline; ethylene glycol; lubricating oil; mineral spirits; and liquid trichlorethylene. 203

A New Composite Steel for Knives and Blades

A new composite tool steel, known as Type R, has been developed by the Jessop Steel Co., Washington, Pa., for use in chipper knives, planer knives, paper knives, and blades for cutting light sheet metal. The fatigue and shock to which these tools are subjected limits the carbon content of the tool steel that can be used. The first approach to this problem was the combining of a high-carbon steel with a low-carbon

To obtain additional information on materials described on this page, see lower part of page 184.

steel in a composite section designed to obtain the best properties of both metals.

There are several methods of manufacturing composite sections. In the Jessop process, flat bar stock is formed by the diffusion welding of high-speed steel to a backing steel of low alloy content. The tool-steel portion of the composite bar stock extends from the edge of one flat surface to within 1/4 inch of the center line, and consists of approximately 40 per cent of the total thickness. This method combines the hardness and edge-holding properties of high-speed steel with the shock resistance of the low-alloy steel. Also, the slots and holes in the back of the knives can easily be machined in the low alloy portion that extends to the center of the bar. This type of steel is available in standard sizes of from 2 to 10 inches. 204

Improved Electrical Insulating Board Made of Non-Cotton Cellulose

A 100 per cent non-cotton cellulose electrical insulating board designated "Durok," and having better characteristics than 100 per cent rag board, has been announced by Rogers Corporation, 37 Mill St., Manchester, Conn. This board has a dielectric strength ranging from 400 to 600 volts per mil. Tensile, elongation, tear, and Mullen tests show the new product to be at least 15 per cent stronger than Duro, the company's 100 per cent rag board. Because of complete absence of chemical treatment or sizing, Durok is neutral, has good heat-aging characteristics, readily dries out with a shorter baking cycle, and absorbs insulating varnish. 205

Synthetic Material Superior to Natural Rubber

Laminated washers cut from sheets of Compar, a vinyl resin derivative produced by the Resistoflex Corporation, Belleville, N. J., are now being used by a large radio manufacturer for alignment rings in the assembly of metal tube bases. According to this manufacturer's maintenance records, the synthetic rings wear twenty times longer than the previously used molded natural rubber rings. The rings, which are exposed to constant abrasion during assembly, are die-cut from Compar sheet stock. . .206

Miccroloid Provides Protective Coating Against Corrosion

A new industrial maintenance coating for greater protection against corrosion has been announced by Michigan Chrome & Chemical Co., 6340 E. Jefferson Ave., Detroit 7, Mich. This corrosive resistant, known as "Miccroloid," which is compounded from thermoplastic resins, provides a tough, resilient, firmly adhering film which offers a high degree of protection against severe corrosive conditions.

This product has its most effective application where a painted surface comes in continual contact with water or corrosive chemicals. It is softened or dissolved by ketones, esters, aromatic hydrocarbons, and trichlorethylene, but is highly resistant to standard gasolines, oils, and aliphatic hydrocarbons.

It is expected to find immediate use in widely varying industries for plating equipment, acid and alkali rinse tanks, structural steel, factory walls and floors, pipe lines, air ducts, blower equipment, ventilating systems, process piping and tubing, water storage cases, water softening and refrigerating equipment, photo equipment, etc. It is effectively used on metal, concrete, and wood surfaces, and on the exterior of tanks heated up to 150 degrees F. 207

New Lubricant Lengthens Drill Life by Reducing Breakage

A new compound called "Elf" drill lubricant has been developed at the Consolidated Vultee Aircraft Corporation, San Diego, Calif., and is now being manufactured by the Aviation Lubricants Co., Box 1607, San Diego, Calif. This lubricant, which has a paraffin wax base and looks much like shoe polish, is packaged so that it can be applied simply by running the drill through a cardboard container. Use of the lubricant increases drill life by reducing breakage; helps eliminate hole elongation; prolongs drill sharpness; and decreases drill operating temperatures. In drilling "Dural," the new lubricant has been found to prevent "welding" of the "Dural" to the point of the drill. 208

Compound for Removing Flux and Welding Scale from Metal

Flux and welding and brazing scale can be removed in five to fifteen minutes from metal surfaces by the use of a new compound known as Optimus deoxidant No. 3, made by the Optimus Detergents Co., 159 Church St., Matawan, N. J. The new compound is not a bright dip and is not intended to replace acid in ordinary pickling, but can be used on most metals as a mild deoxidant without serious etching of the surface. It is used regularly on welded steel tubing; brazed, hot-rolled, and cold-rolled steel; copper; brass; welded aluminum; cast iron; bronze castings; and most aluminum alloys. .209

To obtain additional information on materials described on this page, see lower part of page 184.

Automatic Positioning Control Speeds Welding

Using an Adjustable-Speed Drive with a Welding Positioner, Appreciable Reductions in Set-Up and Handling Time have been Obtained by the Reliance Electric & Engineering Co., Cleveland, Ohio

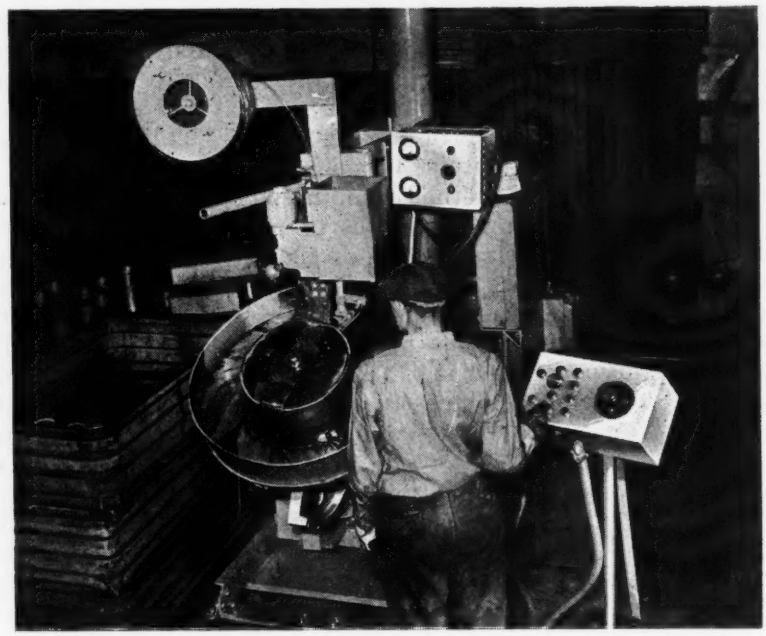


Fig. 1. All Control Functions are Centered in a Single Portable Station. Manipulation of the Simple Rheostat Varies the Table Speed. The Large Mushroom-head Button Stops the Welding and Table Automatically

PERHAPS the greatest improvement in production tools during the last ten years has been in the simplification and increased efficiency of controls which have made these tools automatic. This has been especially true in the welding field. Previously, welding was a piece-work job, depending almost entirely upon the skill of the individual craftsman. Then the war brought about a shortage in the supply of skilled welders, and it became important to design machines that would do a satisfactory job without depending too much on the ability of the individual operator. To meet this need, welding equipment in which the feeding of the electrode is automatic was introduced. Thus, the welding operation was facilitated and the uncertainty of the human element greatly reduced.

Ordinarily, because of the length of time required for setting up, automatic welding is advantageous only under high-production conditions involving a large number of similar operations. In automatic welding, there are two elements that control the speed of production—welding time and handling time. Formerly, it was welding rather than handling time that presented the production problem. With welding speeds of 40 inches per minute being attained at the present time, and speeds of 70 to 100 inches per minute within reach, this problem has been largely solved, so that the situation has been reversed; now it is handling time rather than welding time that is the principal limiting consideration.

Several factors make up handling time, an important element being the operation of the positioner. As originally designed, the function of a positioner was merely to hold the work for "down welding" by hand. Little else was expected of it. Operated in the simplest possible way, either by hand or jogged with alternating-current motors, low cost was the principal consideration. With the utilization of automatic welding, however, the positioner has become a potential continuous operating production tool, making possible simpler and more accurate control of the work.

When the Reliance Electric & Engineering Co., Cleveland, Ohio, was first confronted with the problem of producing large numbers of welded parts for the Navy, a continuous welding head was purchased and a welding positioner rebuilt. The control for automatic welding was supplied by the builder of the head, but was not synchronized with the table control. It was soon found that for good results, the table and the arc should start simultaneously. As a result, controls for the electrode feed and the table movement were synchronized.

In designing controls for production tools, simplicity and ease of operation are the first requirements. The simpler the operation, the more probable its effective use by operators who vary in experience and skill. To achieve this, Reliance engineers centered all control functions in a single portable station, as shown in Fig. 1.

Practically an infinite number of speeds, pre-

determined for each job, were made available by applying one of the company's own products —its adjustable-speed "V*S" drive. With this unit, any speed can be set by the operator by manipulating a simple rheostat while keeping his eye on the speed indicator. The actual range is about 0.3 to 3 R.P.M. of the table. As the ratio of motor speed to table speed is 860 to 1, there is ample torque, even at 0.3 R.P.M.

In order to move the work to the proper starting point, the operator can, by pressing the appropriate button, rapidly traverse the table, regardless of the operating speed setting and without interfering with it. When contact between the welding rod and the work has been made, and the rod is covered with flux, the operator presses either the "weld forward" or "weld reverse" button, and the welding and table motion start simultaneously. If during the operation, particularly while welding the first pieces of any given run, it is felt that the weld could be improved by a change in table speed, the operator can easily effect this change from his control station while still observing the work.

When the weld is completed, the operator presses the mushroom-head stop-button and the welding stops, the table stops, and the welding rod retracts about 3/4 inch. This is entirely automatic.

For setting up, the welding rod can be manipulated accurately and simply. Originally, this was done by "jogging" and required considerable skill to just make contact. With V*S control, the welding rod can be made to creep down into contact with the work, or can be reversed and moved away. As originally designed, two men were required for setting up. This was due to the fact that the various controls were located at widely separated points. With the portable control station combining at one point all necessary controls, the setting up can be done by one man.

The equipment is simple. The motor, which has a maximum speed of 2600 R.P.M., is connected by a link type V-belt pulley drive giving a speed reduction of about 4.25 to 1 to a worm-gear reducer which gives a reduction of 66 to 1. A single light chain transmits the power directly from the reducer to the table drive-shaft at about a 3 to 1 reduction in speed. Thus, the variable-speed drive is not used as a reducer, but simply to control the table operating speeds in the range of 0.3 to 3 R.P.M.

The special control panel, shown in Fig. 2, would have been considerably smaller if it had been used only for the control of the V*S drive. However, in addition to providing the starter for the V*S control unit and the M-G set for operating the wire-feed motor, it also contains the reversing contactors for the wire-feed motor and the table motor, the table dynamic braking and rapid traverse relay, and the reversing contactors for the tilt motor. This single control panel, however, simplifies the machine wiring, making it possible to combine all controls in a single portable station.

As in all automatic operations using inexperienced operators, the services of a set-up man are required at first. An operator, however, can become sufficiently familiar with the machine so that within a period of thirty days, he can do his own setting up.

The V*S control has so many automatic fea-

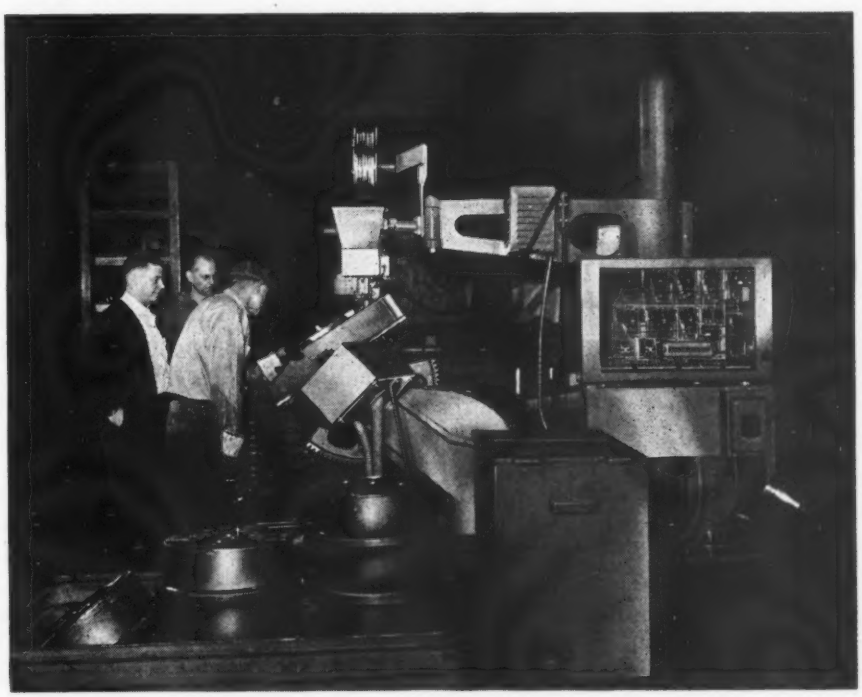


Fig. 2. The Control Panel at the Right, in Addition to Providing the Starter for the V*S Control Unit and the M-G Set for Operating the Wire-feed Motor, also Contains the Reversing Contactors for the Wire-feed Motor and the Table Motor, the Table Dynamic Braking and Rapid Traverse Relay, and the Reversing Contactors for the Tilt Motor

tures that it has gone a long way toward making welding truly automatic. Excellent results can be obtained by inexperienced operators with as little as forty-eight hours of instruction and supervision. Table speeds can be set by anyone capable of reading a dial.

* * *

Machine Tool Manufacturers to Aid in Industrialization of China

An advisory committee of machine tool manufacturers has been organized to determine ways in which the American machine tool industry can participate to the maximum extent in the industrialization of China. This committee was formed at a recent conference in New York of representatives of many outstanding machine tool companies, called by the China-America Council of Commerce and Industry. The discussion was led by Ralph E. Flanders, president of the Jones & Lamson Machine Co., and a director of the China-America Council.

China's machine tool needs for her initial reconstruction program were outlined by Alex Taub, consulting engineer for the reorganized Chinese Supply Commission in America. This program calls for the purchase in this country during the next three years of approximately $2,000,000,000 worth of machinery, equipment, and materials for the rehabilitation and expansion of industry, transportation, and agriculture in China.

The companies represented at the conference were: The Black & Decker Mfg. Co., Black Rock Mfg. Co., Billings & Spencer Co., Bullard Co., Cincinnati Milling Machine Co., Consolidated Machine Tool Corporation, DoAll International Co., Ex-Cell-O Corporation, Fellows Gear Shaper Co., General Machinery Corporation, Jones & Lamson Machine Co., R. K. LeBlond Machine Tool Co., Murchey Machine & Tool Co., National Acme Co., New Britain Machine Co., Republic Drill & Tool Co., Sundstrand Machine Tool Co., and Warner & Swasey Co.

* * *

Magnetic Shop Floor Sweeper

An interesting type of shop floor sweeper has been developed by the Sjostrom Machine Co., Lawrence, Mass. This device resembles a vacuum sweeper, and is pushed along the floor in a similar manner; but instead of using brushes, it is provided with a magnet, which picks up all ferrous materials such as chips, filings, screws, etc., on the shop floor. Simple means are provided for dumping the load of chips and metal parts that have accumulated in the sweeper. No electrical connection is necessary, as the magnet is of the permanent type.

National Metal Exposition to be Held in February

Plans have been completed to hold the twenty-seventh National Metal Exposition February 4 to 8, 1946, in the Public Auditorium at Cleveland, Ohio. Originally scheduled for October of this year, the exposition was postponed to avoid interfering with wartime transportation demands. The coming industrial show, according to W. H. Eisenman, managing director of the exposition and national secretary of the American Society for Metals, will be the largest ever held in America. Because of the widespread advance interest in the metal exposition, the floor plans that have been mailed to previous exhibitors show a greater area of exhibit space than any event of this type in the history of United States industrial shows.

The exposition will be held, as usual, in conjunction with the National Metal Congress, sponsored by the American Society for Metals in cooperation with the American Welding Society, the Iron and Steel and Institute of Metals Divisions of the American Institute of Mining and Metallurgical Engineers, and the American Industrial Radium and X-Ray Society. Thus thousands of men in the metal field will not only see all the new products in operation, but will also have the opportunity to hear research papers presented by engineers and technical experts. Further information can be obtained from W. H. Eisenman, secretary of the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

* * *

New Welding Electrodes

Three new Murex welding electrodes, known as Type U, Type MA, and Type 347, have been developed by the Metal & Thermit Corporation, 120 Broadway, New York City. The Type U is a mild steel electrode for general-purpose welding. It is primarily a single-pass fillet electrode which can be used in any position with alternating current or with direct current on either polarity.

The Type MA electrode is designed for all-position welding of carbon molybdenum and other high-strength steels where alternating current is employed. It can, however, also be used with direct current, either straight or reverse polarity.

The Type 347 electrode is intended for welding 18-8, 19-9, and similar stainless steels, where stabilization with columbium is required. This electrode has a titania type coating, and can be used with either alternating or direct current. It is primarily designed for butt welding in the flat position.

Design of Tools and Fixtures

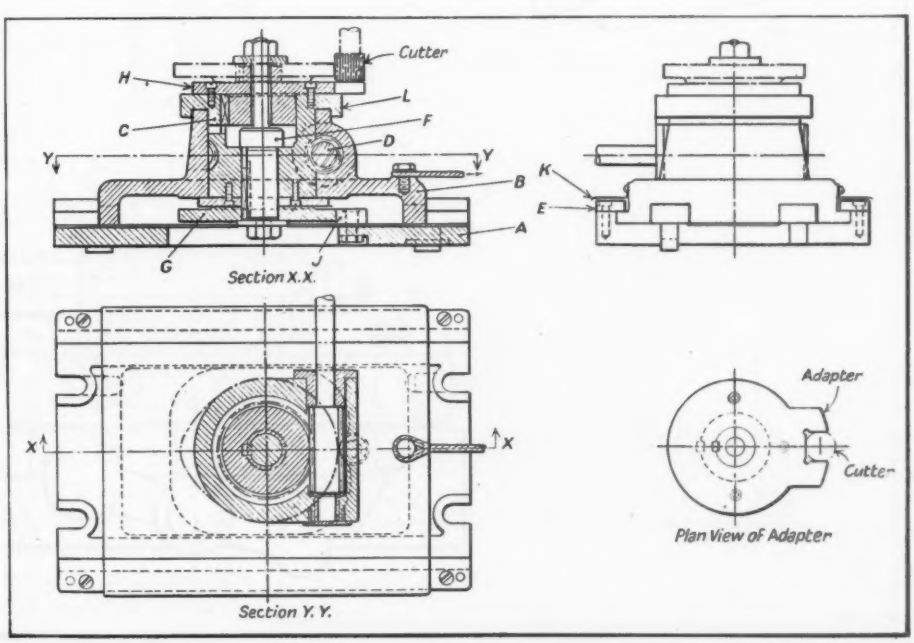
Fixture for Milling Face-Cam Profiles

The fixture here illustrated is used in milling the profiles of face-cams of the design indicated by the dot-and-dash lines. The cam blank to be profile-milled is mounted on the adapter *H*, which is rotated by worm *D*. The shaft of worm *D* is coupled to the universal-jointed driving shaft normally provided on the milling machine for operating a circular milling table.

The master cam *G* with the profile to be duplicated on the work by the milling cutter is mounted on the same shaft as adapter *H* and rotates with the work. The casting *B*, which carries the work, master cam, and driving worm, is free to slide on the base *A*. Base *A* is fastened to the milling machine table. The follower roller *J*, of the same diameter as the milling cutter, is mounted on a fixed stud on base *A*. A wire cable attached to the sliding member *B* runs over a pulley in a bracket fastened to the end of the milling machine table, and carries a weight at its free end, which serves to keep the master cam *G* in contact with roller *J* during the profile milling operation.

In setting up the fixture, the adapter *H* is placed in position on the drum *C*, and the machine table is moved until the cutter is registered symmetrically in the gage incorporated in the adapter, as shown in the view in the lower right-hand corner of the illustration. The table is then locked, the cutter now being in its correct relative position with respect to the master cam profile and vertically above the roller *J*.

Next, the weight is removed from the wire cable, the cutter raised, the blank to be profile-milled bolted on the adapter, and the weight replaced. Upon starting the machine, the milling of the cam profile proceeds automatically, the blank being fed to the cutter by the action of the weight until the master cam makes contact with the roller *J*. The worm-shaft *D* drives the drum at a suitable speed, and at the same time, the master cam *G* is held in contact with the roller *J* under the pressure exerted by the



Fixture Designed for Profile-milling Face-cam Mounted on Adapter H

weight. This arrangement controls the sliding motion of the upper part of the fixture and the work in accordance with the contour or profile of the master cam *G*.

Chips are prevented from reaching the drum bearing surfaces by the flanged top at *L*, and are also excluded from the master cam and roller. Shields *K* attached to the sliding member *B* serve to prevent chips from reaching the bearing surfaces in the base. Strips *E* attached to base *A* hold the slide *B* in place and yet permit it to slide freely.

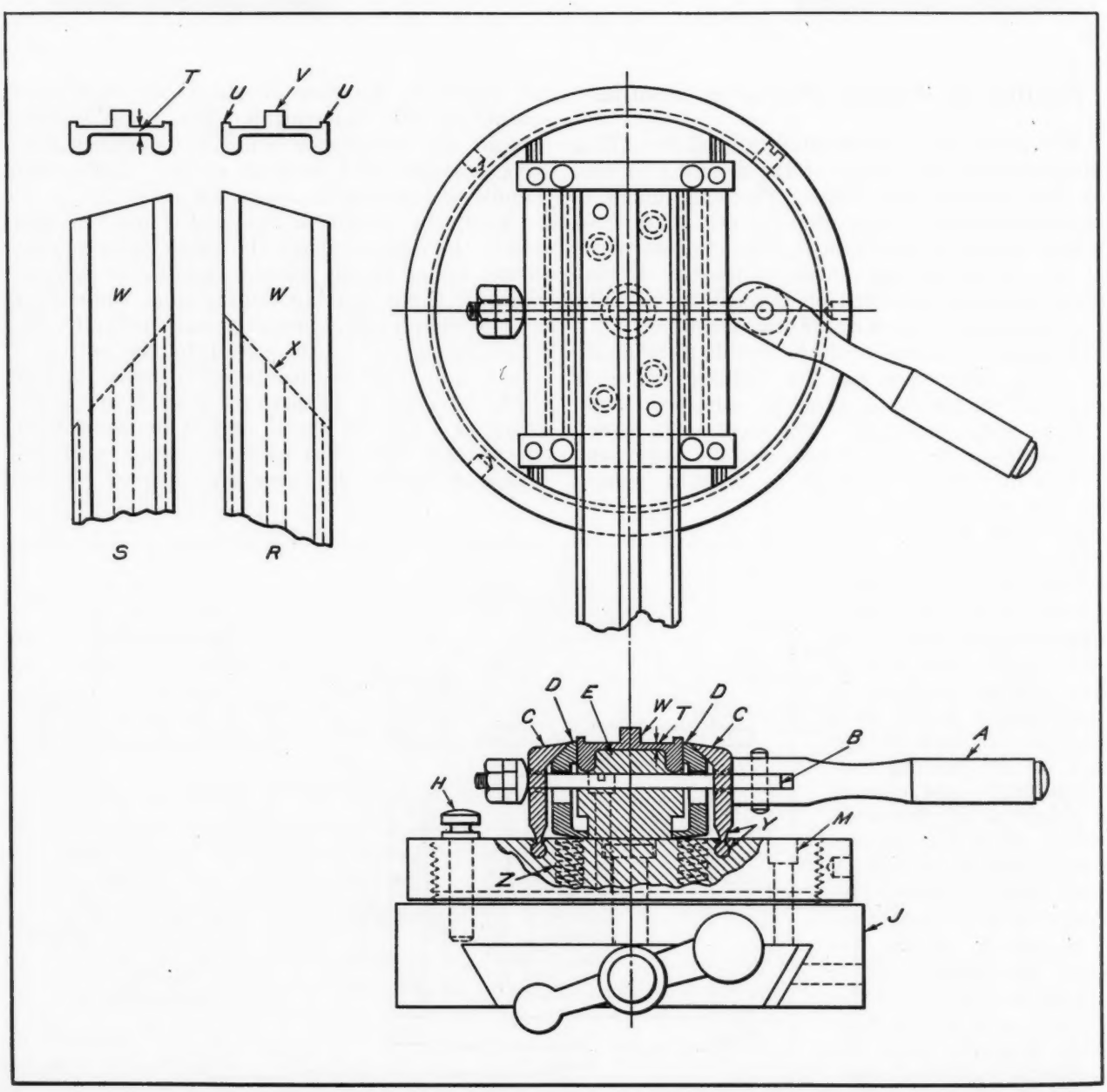
Although the fixture described was designed for milling the particular cam shown by the dot-and-dash lines in the illustration, it will be evident that this fixture is adaptable to a variety of profile milling operations.

Milling Fixture for Airplane Parts

By W. D. WHITE, Detroit, Mich.

The milling fixture shown in the accompanying illustration was designed and built by the writer while in charge of a tooling and engineering company. Because of a shortage of milling machines, the fixture was designed for use on a lathe. The cutter employed for the milling operation is mounted on an arbor held between the lathe centers, and the fixture is mounted on the cross-slide *J* of the lathe.

In operation, the handle *A*, pivoted on bolt *B*, is pulled toward the operator to clamp the work *W* in place. The eccentric end of handle *A* draws the two clamping members *C* toward each other,



Fixture Mounted on Lathe Cross-slide for Milling Airplane Part W

forcing the two gripping jaws *D* firmly against the work. Jaws *D* are also forced downward by the action of the angular surfaces on members *C*, causing the work to be carried down with them and to be firmly seated on the adapter *E*. The jaws *D* have a vertical travel of approximately 5/16 inch, which insures clamping the work securely on adapter *E*. This work locating and clamping arrangement insures holding dimension *T* of the work to a uniform thickness of 0.096 inch plus or minus 0.001 inch.

The work *W* is made in right-hand and left-hand styles, as indicated by the views *R* and *S*, respectively. The milling operation for the right-hand piece *R* serves to cut away the ribs *U* and *V* up to the diagonal line *X*. By withdrawing the locating pin *H* and removing the hold-down screws *M*, the fixture can be swung around, relocated, and clamped by these members in the correct position for the milling operation on the left-hand piece *S*.

The work was formerly held in special vise jaws, using six clamping screws which had to be tightened and loosened for each operation. The time required to clamp and unclamp the work with this fixture was four minutes, whereas the clamping and unclamping of the work in the new fixture takes only ten seconds. The total number of pieces made in ten hours using the old fixture was fifty-five, compared with two hundred pieces using the new fixture.

Die Equipped with Three Tool Bits for Notching Flanged Shell

By JOHN P. JUNK, Miami, Fla.

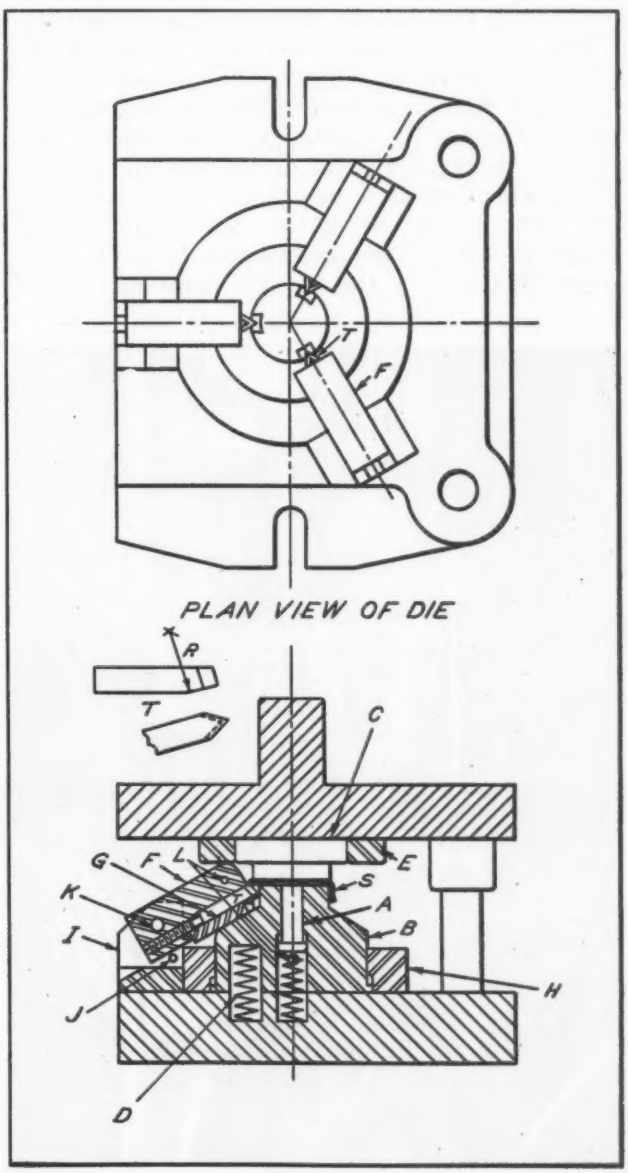
A departure from the usual method of placing all piercing tools in the punch will be noted in the design of the die shown in the accompanying illustration. With this die, the notching of flanged shell *S* in three places is accomplished simultaneously by three tool bits *T* mounted in holders *F*. By using ordinary lathe tool bits in holders hinged to the die proper, as shown, instead of the more conventional type of angular punches in a punch plate, much cleaner cuts, less deformation of the work, and increased production were obtained.

The shell *S*, formed in a previous operation, is made of 0.025 per cent carbon steel of No. 17 (0.055 inch) U. S. gage thickness. It is 2 3/8 inches in diameter at its closed end and 9/16 inch deep, including a 15-degree flange, 1/4 inch long, bent outward around the entire edge of the open end. The die is required to lance the three equally spaced V-shaped notches inward around the straight periphery of the shell.

The die, designed for use on a 25-ton single-action press, consists of but a few parts. Its action will be immediately apparent to experienced tool designers and shop men, but the use of turning tools for the notching operation is so unusual that it merits attention.

The work *S* is placed over the stripper pin *A*, and is approximately located on die *B*. As the ram descends, punch *C* presses the shell positively over the die locator, which moves downward against the pressure of three springs *D*. The hardened ring *E* comes in contact with the ground radii of the tool-bit holders *F*, which causes the bits to pierce the shell, cutting V-shaped notches with the notched parts of the flange bent inward at a 30-degree angle. Slots are machined in the die locator to provide clearance for the inward bent portions of the flanges.

The hardened and ground plates *G* attached to the tool-bit holders by means of four socket-



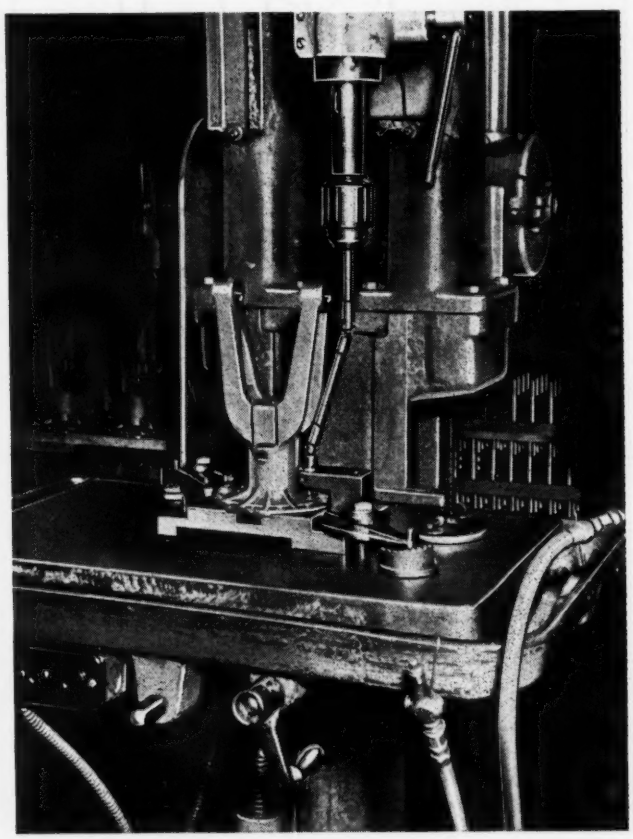
Diagrams Showing Method of Using Three Lathe Tools T as Punches for Notching Flange of Shell S

head cap-screws serve the dual purpose of providing a snug slip fit for the tool bits and stopping the downward and inward stroke at the proper angle. The hardened die retainer ring *H* has three flats ground on its outer periphery against which the hinge brackets *I* are placed and doweled to the die-block. An angular groove is end-milled near the bottom of the bracket to facilitate adjustment of the set-screws that back up the piercing tools. The tool-holders are assembled to the brackets by means of the hinge-pin *K* before attaching the die-block, and a dowel-pin at *J* is driven through both walls to limit the swing of the tool bits.

Using the construction holes bored at *L*, the die can be accurately set up by further grinding of the three flats on the die retainer ring. Any additional adjustment necessary to hold the part to tolerances of plus or minus 0.010 inch can be obtained by loosening the lock-screws and adjusting the tool bits by means of the set-screws.

The 3/8-inch square tool bits *T* are of the solid high-speed steel type. Instead of a negative back rake, a convex radius *R* is ground to compensate for the downward stroke of the ram and the arc-shaped paths of the tool bits as they swing about their hinge-pins. Since this arc will vary as the set-screws are adjusted, the length of the convex radius can be given only approximately on the design drawing. If it were omitted entirely and the tool bits left straight, the V-shaped flange would have a tendency to curl away from the point of the tool and the thin metal of the shell would buckle or tear.

The cutting edges of the tool bit are ground to the desired shape of the notches, and a 10- to 12-degree side clearance angle is ground to provide a clean cutting action and to back off the front piercing point so as to avoid interference with the shell on the return swing.



Method of Counterboring Holes Close to the Body of a Wishbone Casting

Counterboring Obstructed Holes

By E. E. FORSTROM
Bryant Electric Co., Bridgeport, Conn.

Counterboring holes located in the base of a wishbone casting close to the body proved difficult and time-consuming until the set-up shown in the accompanying illustration was adopted. The arrangement includes an inexpensive fixture clamped to the drill press table. The casting is placed in the fixture, being located from an accurately machined cylindrical surface on its base. An overhanging arm of the fixture holds the bushing that lines up the counterbore with the previously drilled hole in the casting. Power is transmitted to the counterbore from a standard drill chuck through a pair of universal joints. The lower universal joint has a hole drilled in its end to take the counterbore and is provided with a set-screw to hold it.

The depth to which the counterbore cuts is determined by using a special one-piece counterbore consisting of pilot, stop-ring, and cutting portion. The distance from the cutting edges to the face of the stop-ring is held to a close tolerance.

The operator uses the handle on the drill press to lower the counterbore into the casting. The correct depth is reached when his sense of touch tells him that the stop-ring is resting on the casting surface; then he raises the spindle, turns the casting in the fixture, and counterbores the next hole.

* * *

Relative Cost of Magnesium

The price of magnesium ingots has followed a downward trend as the production facilities for magnesium have been developed. In 1915, magnesium cost $5 a pound; in 1939, 27 cents a pound; and in 1943, 20.5 cents a pound. On a weight-for-weight basis, magnesium is more expensive than the other commonly used commercial metals, but on the basis of cost per unit of volume, magnesium is cheaper than some of its competitors, because of its light weight.

New Trade Literature

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

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Handbook on Cutter and Tool Grinding

COVEL MFG. CO., Benton Harbor, Mich. Operators' instruction manual and handbook on universal cutter and tool grinding, containing complete information for the operator on types of machines, selection of wheels, operating speeds, methods of grinding, and other valuable tabular matter. Copies can be obtained without charge by users of this equipment if requested on a company letter-head addressed directly to the Covel Mfg. Co.

Data for Determining Shaft Sizes

DE LAVAL STEAM TURBINE CO., WORM GEAR DIVISION, Trenton 2, N. J. Bulletin WG-545, containing data for determining stresses, deflections, torques, and bending moments in solid, hollow, keywayed, and stepped steel shafts. Copies can be obtained without charge if the request is sent on a business letter-head addressed directly to the company.

Gaging Equipment

FEDERAL PRODUCTS CORPORATION, 1144 Eddy St., Providence 1, R. I. Book entitled "Over 7000 Ways to Control Dimensions," listing more than one hundred typical Federal dial indicating gages and their applications. Copies will be sent free if requested on a company letter-head, addressed directly to the manufacturer.

Copper-Base Alloy Handbook

BRIDGEPORT BRASS CO., Bridgeport 2, Conn. Technical handbook containing 128 pages of data on copper-base alloys. Copies can be obtained free by writing on a company letter-head to the Bridgeport Brass Co.

Precision Production Tools

ACME TOOL CO., 200 Church St., New York 13, N. Y. Catalogue 45, illustrating and describing precision production tools. A copy will be sent upon receipt of a request on a company letter-head.

Production Planning Cards

PLAN-O-MILL CORPORATION, 1511 E. Eight Mile Road, Hazel Park,

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[SEE OTHER SIDE]

Mich. Production planning data cards designed to simplify the layout of production flow by providing scale machine models of Plan-O-Mill thread and form milling machines which can be placed on the factory floor plan and arranged to meet particular production or space requirements. 1

Machine Tool Drives

CULLMAN WHEEL CO., 1352 N. Altgeld St., Chicago, Ill. Bulletin on machine tool drives consisting of individual electrical motor units designed to eliminate countershaft and overhead belting arrangements, and adaptable to engine lathes, bench lathes, shapers, milling machines, screw machines, punch presses, and other machine tools. 2

High-Speed Grinding

ELECTRO REFRACTORIES & ALLOYS CORPORATION, Buffalo 2, N. Y. Catalogue 645, describing high-speed grinding with "Electro" resin-bonded grinding wheels; contains information of aid in selecting the correct wheel for various classes of work, maximum operating wheel speeds, formulas for calculating surface speeds, and other helpful grinding data. 3

Sprockets

CULLMAN WHEEL CO., 1352 N. Altgeld St., Chicago, Ill. Catalogue 21 (79 pages, 8 1/2 by 11 inches), containing complete tabulated data on block and roller sprockets and chains, hubs and flexible couplings, silent chains and sprockets, and machine tool drives; also includes horsepower tables and sprocket diameter tables. 4

Wire Cloth and Screens

LUDLOW-SAYLOR WIRE CO., Newstead Ave. and Wabash Railroad, St. Louis 10, Mo. Price list No. 81, covering square-mesh brass, bronze, and copper wire cloth; square-opening space screens; long-slot woven wire screens; and special wire cloths and screens. 5

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CULLMAN WHEEL CO., 1352 N. Altgeld St., Chicago, Ill. Catalogue 9, covering speed reducers made in single- and double-reduction types for motors from 1/4 to 15 H.P., and with adjustable motor bases or for use with standard flange type motors. 6

Silver Brazing

AIR REDUCTION SALES CO., 60 E. 42nd St., New York 17, N. Y. Booklet ADG-2017, entitled "How to Cash in on the Silver Alloy Ring," describing the Silbraz joint and "Aircobraze" oxy-acetylene outfit for making it. 7

Production Attachments

ERRINGTON MECHANICAL LABORATORY, Staten Island 4, New York, N. Y. Catalogue covering Errington production attachments, including tapping chucks, die-heads, screwdrivers, multiple drilling and tapping heads, adjustable-spindle drilling heads, etc. 8

Engineering Data on Milling and Broaching Machines

CINCINNATI MILLING MACHINE CO., Cincinnati 9, Ohio. Engineering Data Supplement M-1418, covering Cincinnati Hydromatic milling machines, broaching machines, and contour cutter sharpening machines. 9

Precision Collets and Feed-Fingers

GENERAL DIE & STAMPING CO., 262-272 Mott St., New York 12, N. Y. Circular announcing the new Brown & Sharpe series of Precision collets and feed-fingers for automatic and wire-feed screw machines. 10

Screw Thread System

AIRCRAFT SCREW PRODUCTS CO., INC., 47-23 Thirty-fifth St., Long Island City 1, N. Y. Bulletins covering Heli-Coil spark-plug bushings, Heli-Coil screw thread inserts and Aero-Thread screw thread system. 11

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Floating-Disk Clutches

CARLYLE JOHNSON MACHINE CO., Manchester, Conn. Installation and Data Book No. 45, describing the design principles and applications of Maxitorq floating-disk clutches; illustrated with photographs and drawings. ——— 14

Automatic Drill Chucks and Tapping Attachments

WAHLSTROM TOOL DIVISION OF AMERICAN MACHINE & FOUNDRY CO., 5502 Second Ave., Brooklyn, N. Y. Circular 56, describing Wahlstrom automatic drill chucks and tapping attachments. ——— 15

Industrial Furnaces

W. S. ROCKWELL CO., 200 Eliot St., Fairfield, Conn. Bulletin 413E, on electric oven furnaces; bulletin 413G, on gas-fired oven furnaces; bulletin 413L, on oil-fired oven furnaces; and bulletin 417 on Kleenmetal oven furnaces. ——— 16

Universal Tool Grinders

GALLMEYER & LIVINGSTON CO., 305 Straight Ave., S.W., Grand Rapids 4, Mich. Bulletin illustrating and describing the new Grand Rapids No. 80 hydraulic-feed universal tool grinder with self-contained motor drive. ——— 17

Universal Spiral Dividing Head

KEARNEY & TRECKER CORPORATION, Milwaukee 14, Wis. Catalogue WA12, on the construction and operation of the Milwaukee Model K universal spiral dividing head. ——— 18

Mercury Clutches

MERCURY CLUTCH CORPORATION, 1504 Twelfth St., S. W., Canton, Ohio. Bulletin 108, descriptive of the Mercury Midget clutch for use with 1/4-H.P. motor drives. ——— 19

Automatic Safety Clutches

FLATON MACHINE WORKS, 7829 S. Broadway, St. Louis 11, Mo. Catalogue 345, describing operating mechanism and advantages of Flaton automatic safety clutches. The book includes complete specifications. ——— 20

Rotary Gear Finishers

MICHIGAN TOOL CO., 7171 E. McNichols Road, Detroit 12, Mich. Bulletin 861-4B-45, describing the Model 861-4B fine-pitch rotary gear finisher for finishing small gears to close tolerances. ——— 21

Spanish-English Dictionary of Mechanical Terms

GREENFIELD TAP & DIE CORPORATION, Greenfield, Mass. Spanish-English dictionary of technical terms peculiar to screw threads and threading tools. ——— 22

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NORTON CO., Worcester 6, Mass. Bulletin entitled "The Norton Part in the Production of Electric Refrigeration and Air-Conditioning Units." ——— 23

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LINCOLN ELECTRIC CO., Cleveland 1, Ohio. Circular entitled "Building Your Career in Arc Welding," and leaflet covering the Lincoln courses in welding engineering. ——— 24

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VINCO CORPORATION, 8853 Schaefer Highway, Detroit 27, Mich. Bulletin 91, describing Vinco inspection fixtures and master gears for checking backlash and run-out on all types of gears. ——— 25

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SUPERIOR MAGNESIUM CASTINGS DIVISION, SUPERIOR BEARING BRONZE CO., INC., 140 Banker St., Brooklyn 22, N. Y. Circular containing specific instructions on the machining and finishing of magnesium castings. ——— 26

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PRODUCTION INSTRUMENT CO., 710 W. Jackson Blvd., Chicago 6, Ill. Catalogue listing stroke and revolution counters, electric counters, coil-winding counters, and other counting devices. ——— 27

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SOCONY-VACUUM OIL CO., INC., 26 Broadway, New York 4, N. Y. Booklet containing technical information on hydraulic systems for machine tools. ——— 28

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CHICAGO TOOL & ENGINEERING CO., 8383 S. Chicago Ave., Chicago 17, Ill. Circular 610, on Palmgren under-water arc-oxy cutting and welding equipment. ——— 29

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UNITED ELECTRIC CONTROLS CO., 69-71 "A" St., Boston 27, Mass. Condensed catalogue and price sheet 4591-C of electric controls, including thermostats, pressure switches, etc. ——— 30

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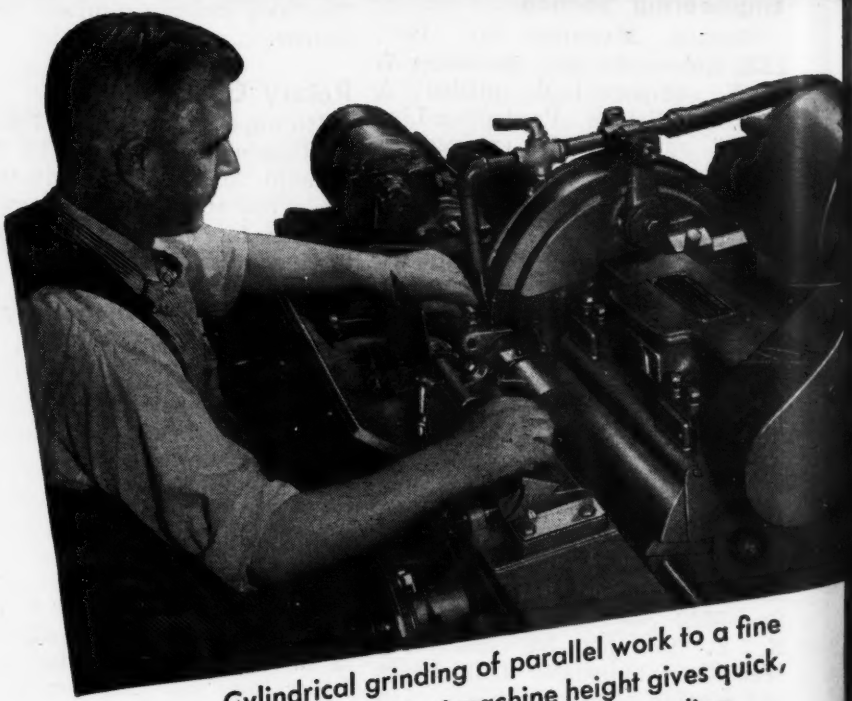

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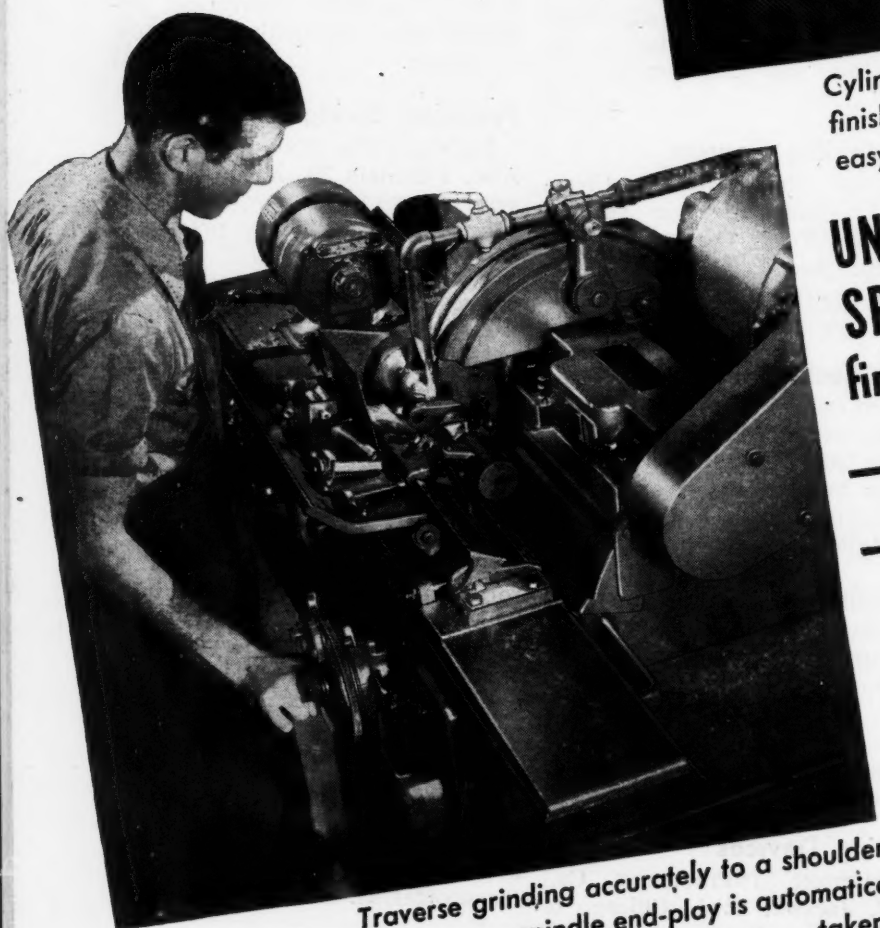

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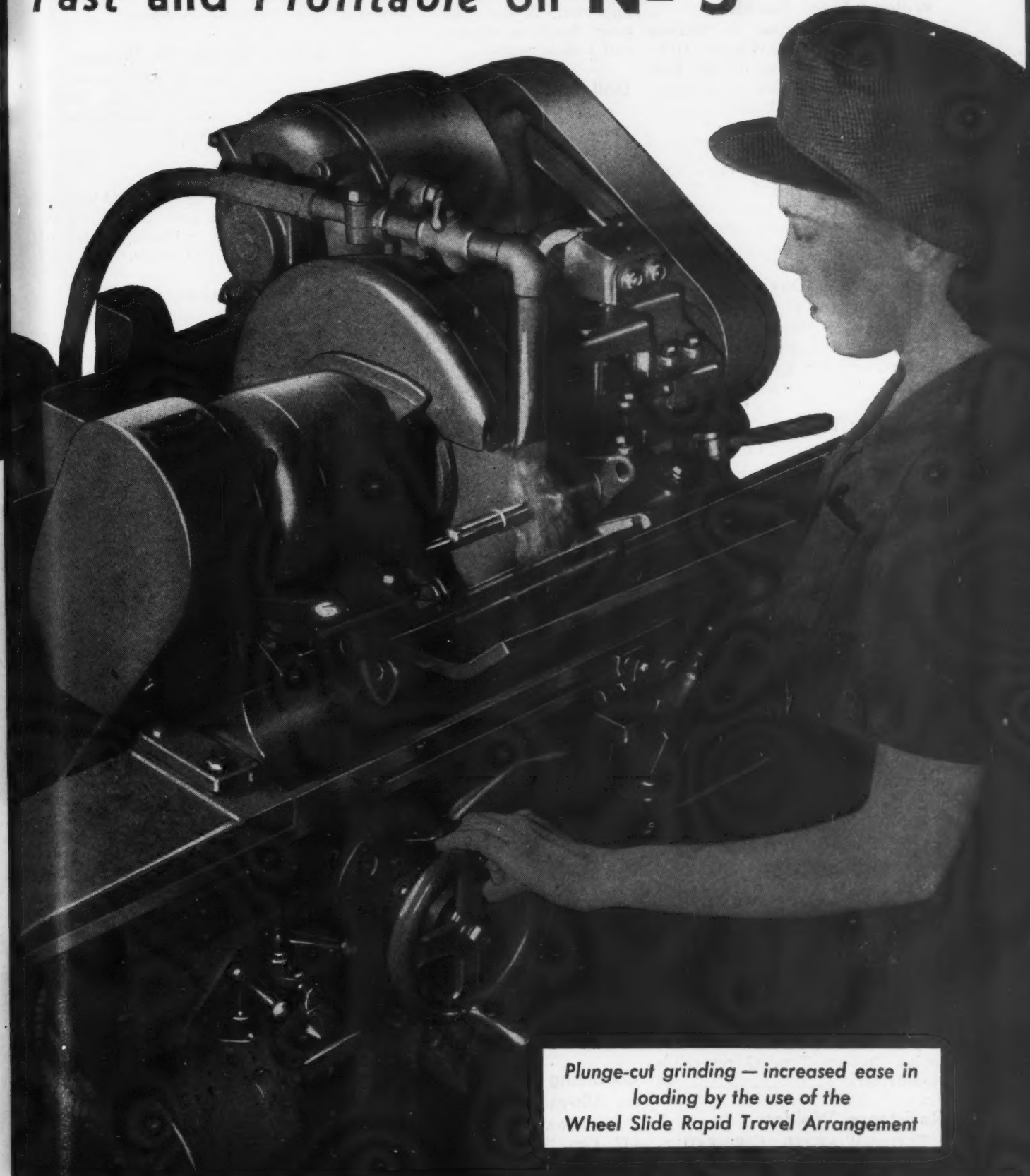

Plunge-cut grinding — increased ease in loading by the use of the Wheel Slide Rapid Travel Arrangement

SHARPE

versary Catalogue 108, on "Certain Curtain" controlled-atmosphere electric heat-treating furnaces. 36

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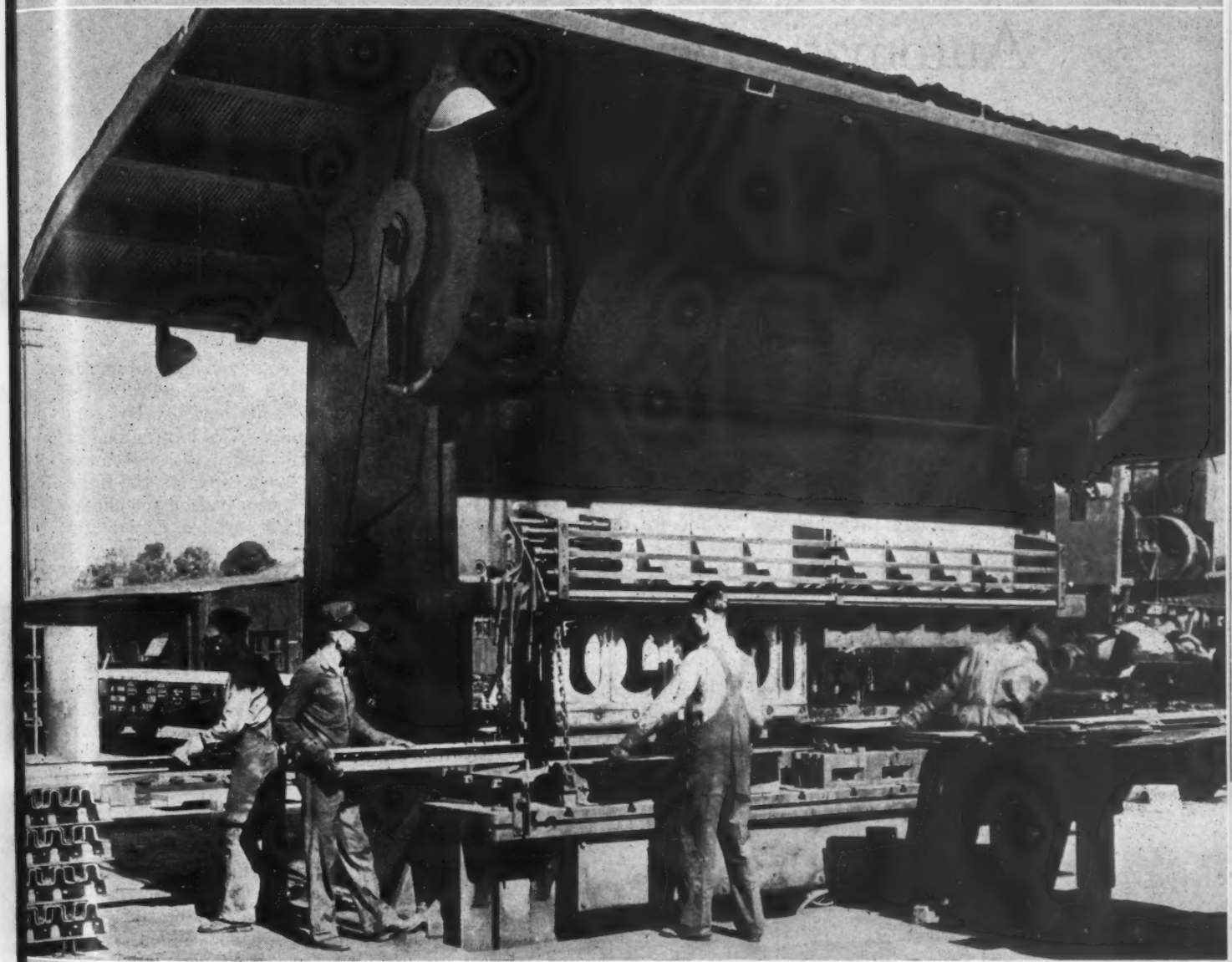
A DAILY DOUBLE...



Punching and forming car side stakes at one stroke is a daily double on this machine—a stake is completed on each hit.

At the right-hand station this Cincinnati Press Brake is punching forty-five $\frac{11}{16}$" holes in these $\frac{3}{8}$" blanks. The stakes are also formed and completed at the left, on the same stroke.

Write for Catalog B-2.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

Bullard Man-Au-Trol—A Completely Automatic Machine Tool Control

This Electro-Hydraulic System, which Provides Automatic Performance of Thirty-Nine Separate Functions, is Now Supplied on Bullard Man-Au-Trol Vertical Turret Lathes

AN electro-hydraulic system of machine tool control which can be preset for the automatic performance of thirty-nine separate functions in any desired sequence has been developed by the Bullard Co., Bridgeport 2, Conn., and was given its first public demonstration at the Bullard plant on October 11. This control, called "Man-Au-Trol," is now available as an integral part of the 30- and 36-inch vertical turret lathes, which are modified machines of the well known "Cut Master" design, and will be supplied on 42-, 54-, 64-, and 74-inch sizes as soon as manufacturing conditions permit. A 36-inch vertical turret lathe equipped with the new control is shown in Fig. 1.

Prior to the war, the first machine incorporating Man-Au-Trol was completed and put into test use. Government secrecy orders were placed on this machine, but these in no way prohibited the Bullard Co. from using the test machine for its own war production. The machine was tooled for an essential war job, and operated continuously throughout the war years. During this period it operated day after day on a twenty-four hour schedule without one work-piece being spoiled.

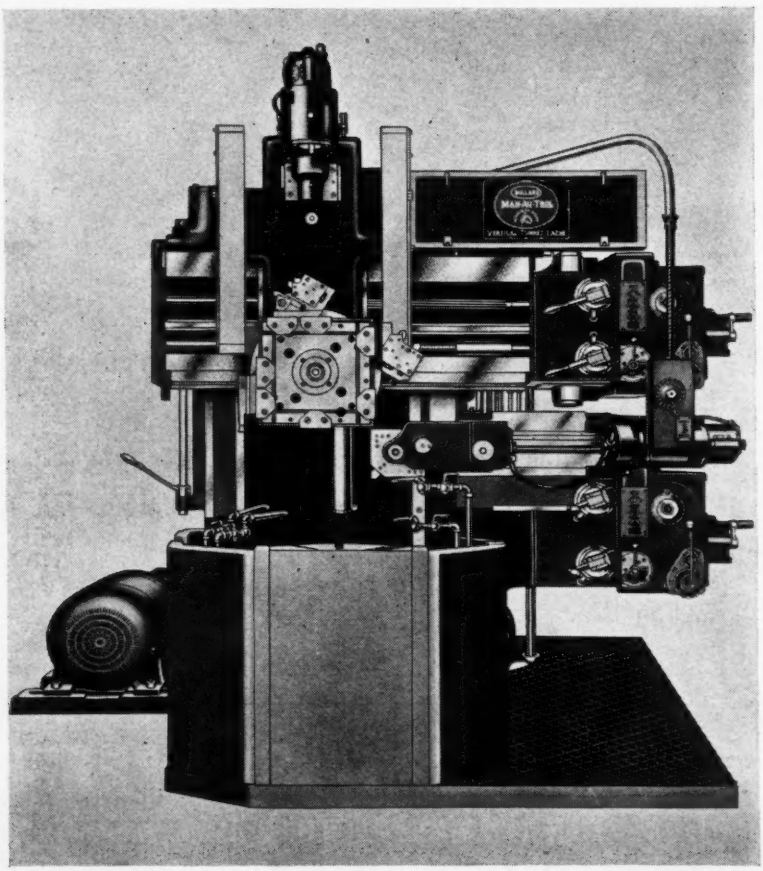


Fig. 1. This 36-inch Man-Au-Trol Vertical Turret Lathe can be Operated either Automatically or Manually

Either Automatic or Manual Operation Possible

Although equipped for automatic operation, the Man-Au-Trol vertical turret lathes can also be operated manually. At any point in the automatic cycle, the movement of a single lever converts the lathe back to manual operation for checking dimensions or tools, or for any other reason. When set for manual operation, pieces can be machined and the machine itself controlled by the operator in exactly the same way as other vertical turret lathes. Returning the lever to its former position restores the cycle of automatic operations without affecting the previous tooling sequence.

In setting up the controls for automatic operation, the work-piece is placed in the chuck and located, and the tools are brought through their respective cuts manually. At the end of each cut, a simple Man-Au-Trol setting establishes an automatic stop for that particular operation. When all operations have been completed and all function stops set, the lathe can be thrown into complete automatic operation, requiring only manual loading and unloading of the work-pieces and the pushing of a single button to initiate each new cycle.

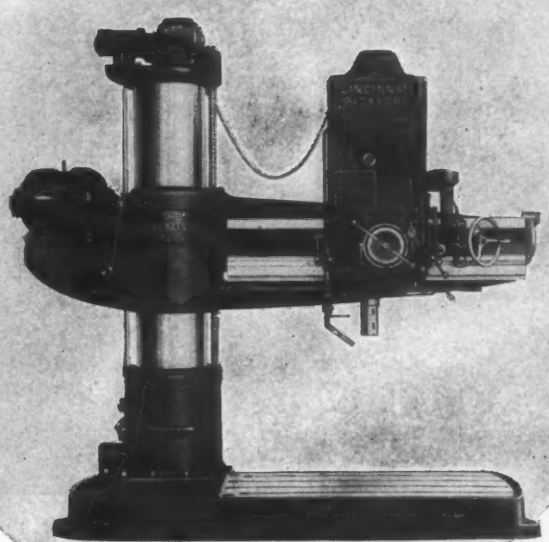
The Man-Au-Trol controls the following functions: (1) Direction of feed on each head—up, down, in, or out; (2) rate of feed of each head—any one of sixteen feeds can be selected and changed automatically, even in the middle of a cut; (3) direction of power traverse on each head—up, down, in, or out; (4) indexing of turret on each

CLOSE TOLERANCE WITH EASE!

The Cooper-Bessemer Corporation says: "The seats for the valves in the Cylinder Head must be smooth and accurate, and this operation is being done very satisfactorily on a Cincinnati Bickford 4' Radial Drill Press. The four valve holes are machined complete in 3.6 hours and held to a tolerance of plus or minus .0005", which includes drilling, rough and finish boring, counterbore and radius. This work is being done with ease by the operator and is free from trouble."

Write for Bulletin R-24A.

See our condensed Catalog in Sweet's File



This Cincinnati Bickford Super Service Radial Drill is maintaining both close tolerance and speed on this exacting job.

RADIAL AND UPRIGHT SUPER C·B SERVICE DRILLING MACHINES

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

head; and (5) spindle speeds. The maximum length of the various strokes is limited only by the size of the machine, and strokes as short as 0.005 inch are obtainable. A high degree of accuracy is provided for all operations.

Two Basic Control Elements

Two basic control elements make up the Man-Au-Trol. The first control element, shown in Fig. 2, is electrical and governs the beginning and ending of each phase of the automatic cycle. It consists of a long, narrow frame which carries twenty pairs of wires parallel to each other. On each pair of wires is mounted a sliding dog or contact. In the case of the 30- and 36-inch vertical turret lathes, there are two of these wire-carrying frames—one for each head. Directly behind or underneath the wires (depending upon whether the frame is mounted horizontally or vertically) is located a bank of twenty small switches which are supported in a fixed position. There is one switch for each contact dog, and as the head is moved, these dogs make contact at different positions with their respective switches.

The other basic element in the control system is hydraulic and selects the operations which make up each phase of the automatic cycle. As shown in Fig. 4, it consists of a steel cylinder or drum which has forty rows of holes around its periphery, each row extending the length of the cylinder. These holes accommodate dogs which, when the drum rotates, are carried past a row of levers that actuate solenoid-operated hydraulic valves. The valves, in turn, start and stop the various functions of the machine. For a few of the operations that are entirely electrical, such as the rotation of the turret heads, small relay type switches are actuated by the respective dogs.

These two control elements, the electrical and the hydraulic, function in close relation to each other. Thus, for each position of the hydraulic valve control drum, a corresponding switch in one of the electric control banks is made "live." It is the position of the contact dog on the wires directly opposite this switch which governs the moment at which contact is made and a new phase of the operating cycle is begun. Only one of these switches is made "live" for each phase of the automatic cycle. In Fig. 3 is shown the end of the hydraulic valve control drum with connecting wires coming from the electric switches to forty contacts around the circumference of the drum—one contact for each indexing position.

Since the position of the sliding contact dogs shown in Fig. 2 must accurately control such functions as the in-feed of tools to tolerances measured in ten-thousandths of an inch, means are provided for exact adjustment. When set in position, each dog is clamped tightly to one of the pairs of wires along which it slides, while it remains free to slide on the other. A micrometer turning arrangement at the end of the wire to which the dog is fixed

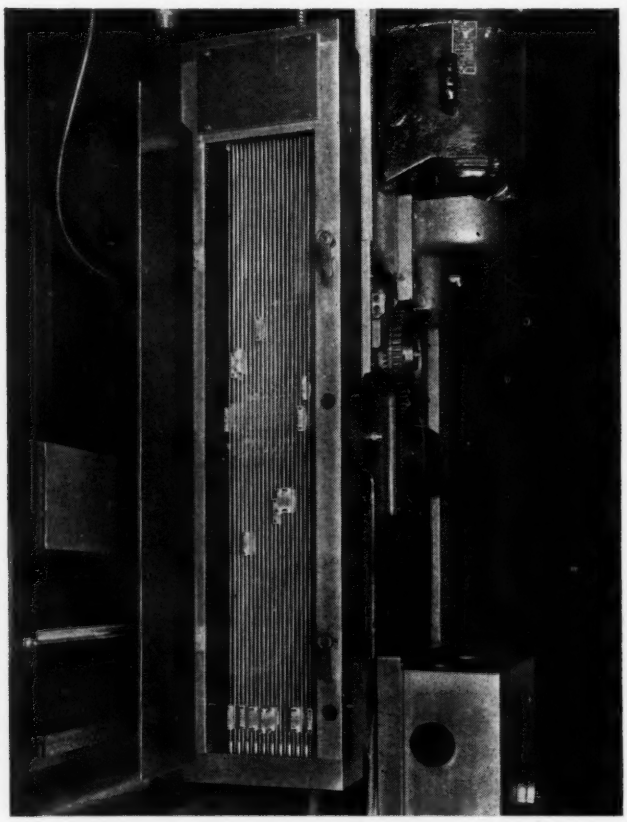


Fig. 2. Electrical Control Element which Determines Beginning and Ending of Each Phase of Automatic Cycle. Dogs are Positioned on the Wires to Make Contact with Switches behind Wires for Different Locations of Machine Head

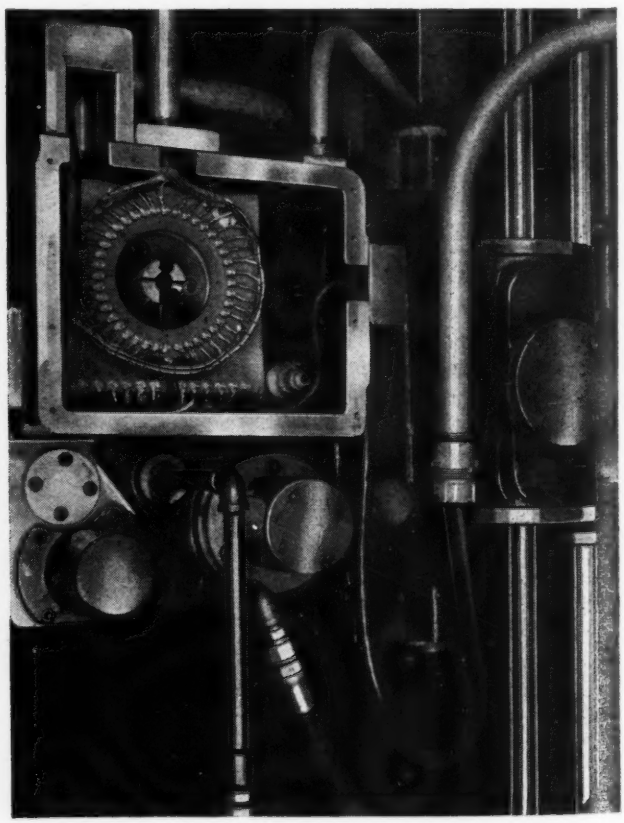


Fig. 3. End of Hydraulic Control Drum Illustrated in Fig. 4, Showing Electrical Connections. The Terminal for Each Indexing Position is Connected to a Corresponding Switch in the Electrical Control Element Seen in Fig. 2

permits exceedingly close positioning of the dog.

Sequence of Automatic Operations

In automatic operation, the starting button is pushed, causing the hydraulic control drum to be indexed 1/40 revolution, which brings one or more dogs set in various holes along the first row into contact with the levers actuating the hydraulic valves. The operation of these valves causes one or more functions to take place, such as the rotation of the table at a given speed, the feeding of the main head horizontally, the raising of the side-head, etc.

At the same time, the first switch in the electric control bank is made "live," so that when it comes in contact with the dog mounted on wires directly opposite it—which takes place after a given movement of the head with which it is associated—the switch is closed, causing the hydraulic control drum again to be indexed 1/40 revolution, and actuating a new set of hydraulic valves to end or begin certain functions of the machine. A second switch in the electric bank then becomes "live." A similar sequence of control functions continues throughout the automatic cycle.

Each of the vertical turret-lathe heads can perform any number of separate functions up to a maximum of thirty-nine. The machine can be set so that one or more heads are operated at the same time. In operations where two heads would interfere during some period of the work cycle, either head can be automatically controlled to stop in any position and to start again after the period of interference is passed. The micrometer electric stops can be altered during operation of the machine, so that accurate compensation for tool wear can be made without removing the tools from the machine or in any way disturbing them.

One feature of this type of control is that fewer tools are required, since the flexible arrangement of automatic sequencing permits one tool to perform several functions, such as the taking of both rough and finish cuts or the boring of several diameters. Since there is no predetermined sequence of functions on the machine, several different tools can be placed in one face in the turret and brought into action one after the other, or simultaneously, by the automatic control mechanism.

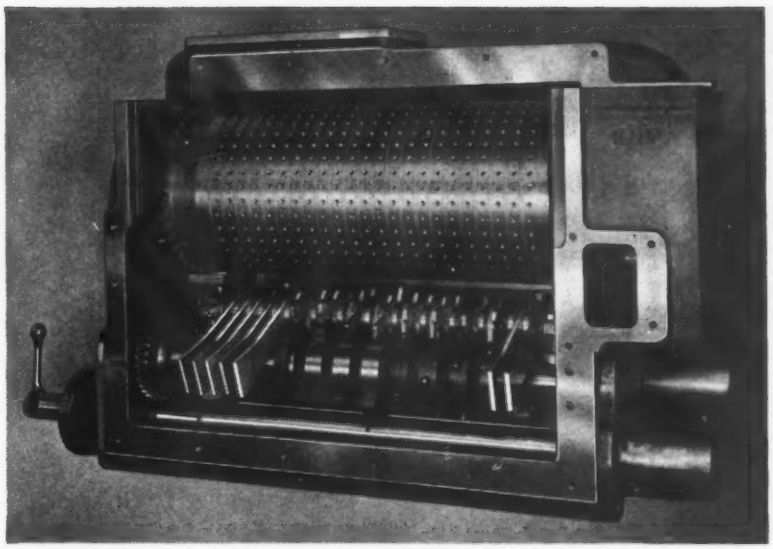


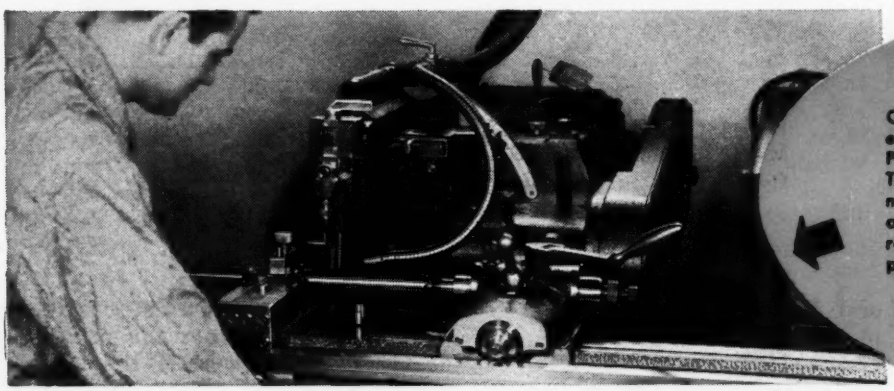
Fig. 4. Hydraulic Control Element that Determines which Machine Functions are Performed in Each Phase of Automatic Cycle. Dogs are Inserted in Holes in Drum to Move Hydraulic Valve Actuating Levers when Drum is Indexed

Man-Au-Trol vertical turret lathes are operated by individual main-drive motors and by auxiliary motors for the main and side heads and, when required, for the cutting lubricant system. Two types of drive are available. The Type SGD, or sliding gear drive, provides three speed ranges, in each of which twenty changes of speed are available for manual operation. In automatic operation, any selection of six out of a set of twenty speeds may be used. The Type CGD, or change gear drive, is available in four arrangements. One utilizes a constant-speed alternating-current motor, for use where only one spindle speed is required; another provides a multi-speed alternating-current motor for two or four speed changes; another provides an adjustable-speed direct-current motor with forty speed changes, from which a choice of three speeds is available for automatic operation; and another provides a variable-speed motor drive.

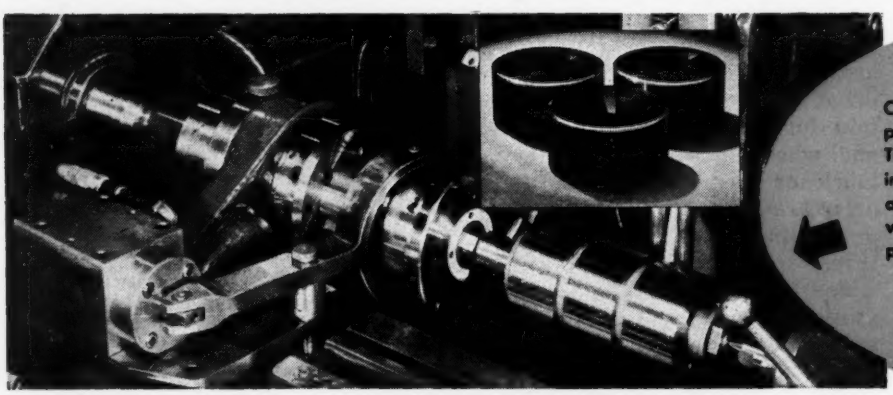
Each head is actuated by means of a feed bracket which has sixteen feeds ranging in geometrical progression from 0.0006 to 0.125 inch, inclusive, per revolution of the work spindle. Smooth feeds are assured by positive feed-screws or worms, there being no cams or hydraulic cylinders used in the feed mechanism. The construction is designed to assure a positive and constant rate of feed under all conditions, regardless of the fineness of feed or the heaviness of cut. Power traverse and hand motion are provided. A safety overload clutch for feeds in any direction is built into each feed mechanism. All clutches and sliding gears in the feed bracket are positioned by means of small built-in hydraulic cylinders, which, in turn, are operated by Man-Au-Trol. When the machine is manually operated, suitable levers are provided for operating these hydraulic cylinders by hand.

With the side-head in position, the 30-inch vertical turret lathe has a 32 1/2-inch diameter capacity, and the 36-inch machine has a 34 1/4-inch diameter capacity. Without the side-head, the 36-inch machine has a 37 1/2-inch diameter capacity. Each machine is equipped with either a three-jaw hydraulically operated or manually operated combination chuck or a four-jaw independent chuck, built into the table. Either the main turret head alone or the turret-head and side-head are furnished. Each head is equipped with a Man-Au-Trol unit, and has a four-face automatic indexing turret.

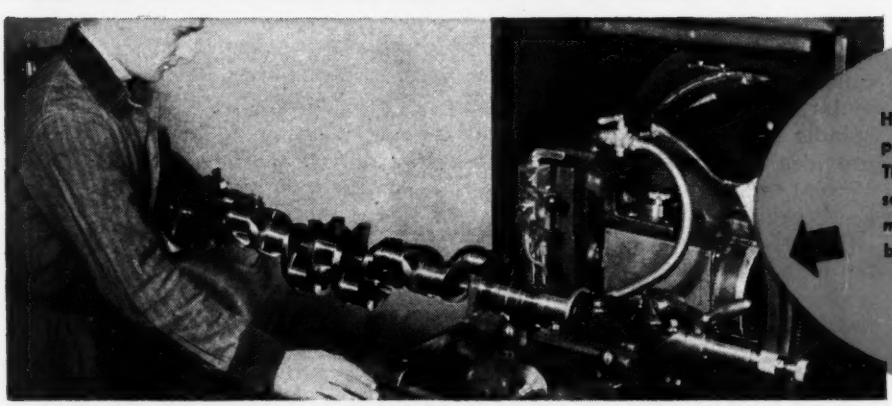
For THREADED



Grinding threads to close tolerance on steel engine part, using an Ex-Cell-O Style 33 Precision Thread Grinder with a 12" swing. The machine is equipped with an approximate work locator to facilitate loading and an automatic retract and rapid traverse return for one-way grinding. The job is completed in two passes—one rough cut and one finishing cut. Production is good.



Cylindrical thread rolling dies are being precision ground here on Ex-Cell-O Style 33 Thread Grinder, equipped with pneumatic indexing fixture that is automatically operated by the machine. This Ex-Cell-O developed indexing fixture can be operated pneumatically, hydraulically, mechanically and manually.



Holding to close limits and maintaining good production, this Ex-Cell-O Style 50 Precision Thread Grinder is grinding threads from the solid on a steel crankshaft. Machine equipment includes live tailstock center assembly, ball-type headstock center, and approximate work locators to facilitate loading.

EX-CELL-O CORPORATION

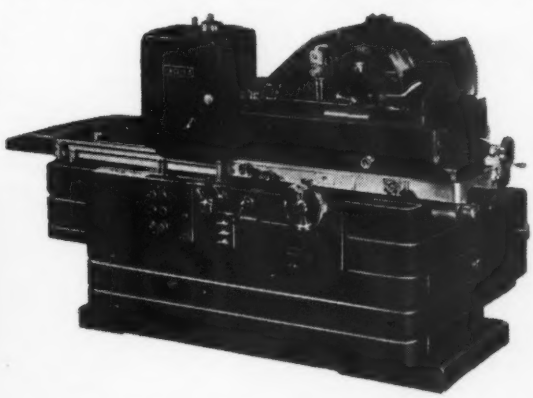
WORK with Accuracy and Finish

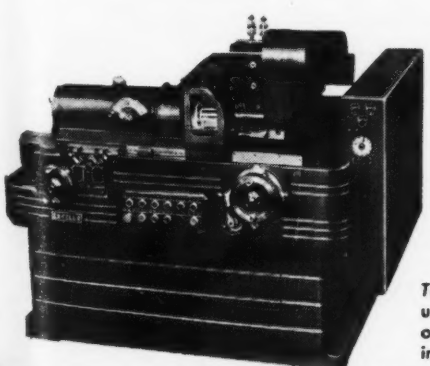
XLO
EX-CELL-O for PRECISION

Use EX-CELL-O Precision Thread Grinders

Wherever accuracy in threaded parts is necessary—accuracy of thread form, size, lead and finish—*thread grinding* is important. Not only does it assure precision work, but frequently it means increased production and lower costs . . . and the reduction in service failures of the parts when in use. Where *hardened* threaded parts must be finished to a high degree of accuracy, *thread grinding* is almost indispensable. Ex-Cell-O has developed precision thread grinding to cover the many requirements of American industry for precision threaded work, for the grinding of internal as well as external threads. There are nine different styles of Ex-Cell-O precision thread grinders—all standard machines—making possible a very wide range of threaded work. Write now to Ex-Cell-O for complete information.

Below: Ex-Cell-O Style 39-A Precision Thread Grinder for the production of *internally threaded* work. Operation is completely automatic except for resetting the grinding wheel, loading and unloading, and depressing the "start cycle" button.





To right above: Ex-Cell-O Style 35 Universal Precision Thread Grinder used for a large variety of work on both small and large production of external threads. Is adaptable for eccentrically relieved grinding and for internal grinding of straight line and radius form threads.

DETROIT 6, MICH.

Standard and Special Multiple Way-Type Precision Boring Machines

•

Multiple Drilling and other Special Purpose Machines

•

Precision Thread Grinding Machines

•

Precision Lapping Machines

•

Broaches and Broach Sharpening Machines

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Continental Cutting Tools

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Tool Grinders

•

Hydraulic Power Units

•

Grinding Spindles

•

Drill Jig Bushings

•

Fuel Injection Equipment

•

R. R. Pins and Bushings

•

Pure-Pak Paper Milk Bottle Machines

•

Aircraft and Miscellaneous Production Parts

45—6B

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Pratt & Whitney Automatic Centering Machine

Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford 1, Conn., has just brought out a 1 1/4-by 18-inch automatic centering machine designed to produce accurately aligned center holes simultaneously in each end of a piece of stock. After the initial set-up, it is only necessary to keep the magazine supplied with work, remove the centered parts, and care for the center drills. The drill feed is operated in conjunction with the automatic work-handling mechanism, the drills being withdrawn twice during the operation to clear out chips and permit oil to enter the drilled holes. After each withdrawal, the center drills are fed in to a greater depth, reaching full depth on the last feed movement.

The two drill spindles are mounted in preloaded ball bearings inside quills, which are actuated by the rack and pinion feed through spring-resilient levers. Both drill heads can be adjusted to any desired position on the bed and positively clamped. Each is driven by a 1/2-H.P. foot-mounted motor. Oil is supplied continuously to the drills from a gear pump, the surplus oil draining into a tank.

The work placed in the magazine is fed by gravity to the transfer slides. The magazine ways have adjustable guides to accommodate work ranging from 3/8 inch up to 1 3/8 inches in diameter. The magazine can be set to accommodate a range of work varying from a minimum length of 3 1/2 inches to a maximum length of 18 inches. The transfer slides carry the work forward from the magazine, one piece at a time, to the centering drills, and hold it in the correct position during the operation.

A compensating arrangement on the V-jaws which hold the work automatically takes care of small variations in work diameter. These jaws can also be adjusted for drilling off-center holes on one or both ends of the work, such as short oil-holes or holes for the driving pins used in grinding. The entire automatic mechanism is driven by a 1/2-H.P. foot-mounted motor. A crank is provided to facilitate operating this mechanism by hand during the setting-up operation. The push-button control is conveniently located at the operator's right hand.

The length of the drill-spindle stroke can be varied from 3/8 inch to 1 1/4 inches, and the maximum countersink diameter is 5/8 inch.

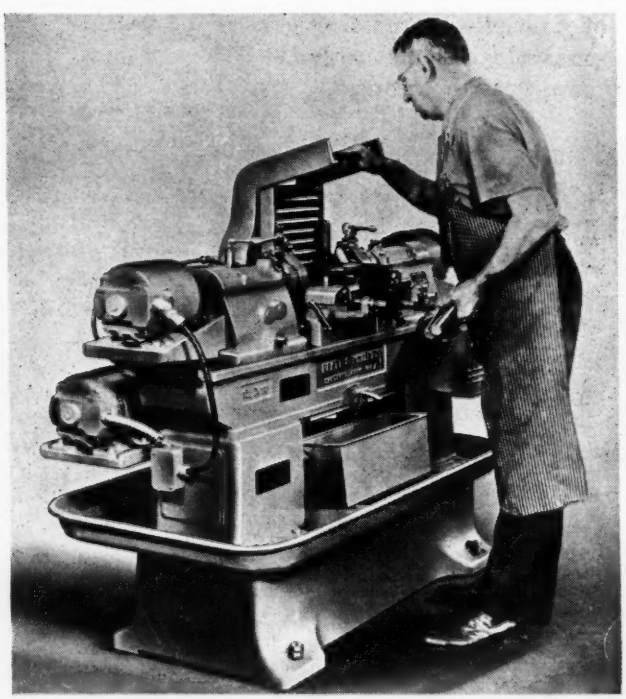


Fig. 1. Pratt & Whitney Magazine-fed Automatic Centering Machine

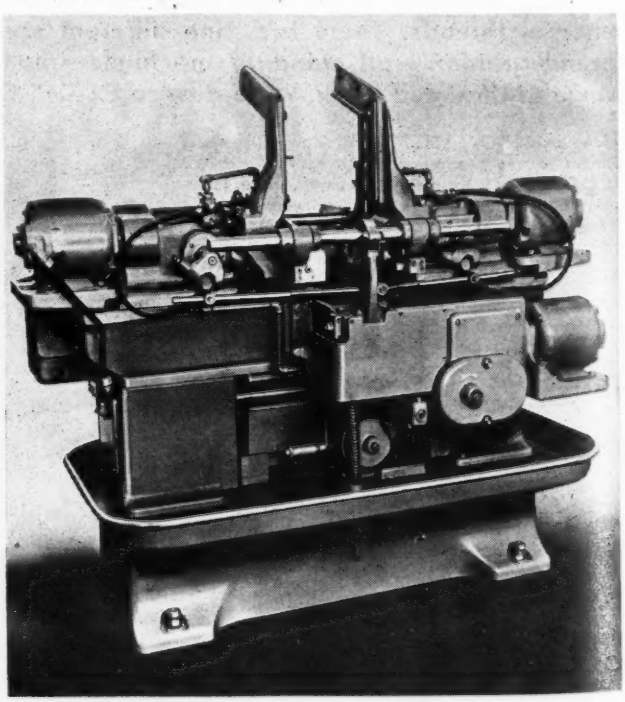


Fig. 2. Rear View of Automatic Centering Machine Shown in Fig. 1

To obtain additional information on equipment described on this page, see lower part of page 184.

TOOL MANUFACTURING AGENTS

Suppliers of Tools, Gages and Special Parts Equipped with Carboloy Cemented Carbide

Allen Gauge & Tool Co., Pittsburgh, Pa.
B. C. Ames Co., Waltham, Mass.
Anderson Bros., Mfg., Co., Rockford, Ill.
Apex Tool & Cutter Co., Inc., Shelton, Conn.
Archer & Smith, Ltd., Lexington, Ky.
Associates Machine Co., Detroit, Mich.
E. C. Atkins & Co., Indianapolis 9, Ind.
Bacharach-Strauss, Pittsburgh, Pa.
Barber-Colman Co., Rockford, Ill.
Barrett Equipment Co., St. Louis, Mo.
Bokum Tool Co., Inc., Detroit 2, Mich.
C & H Gauge Co., Glendale, Calif.
Carbide Fabricators, Royal Oak, Mich.
Carbide Tool Co., Detroit, Mich.
Carbide Tool Mfg. Co., Los Angeles, Calif.
Carey-McFall Co., Inc., Philadelphia, Pa.
Central State Tool Co., Chicago, Ill.
Chicago-LaTrobe Div., United Twist Drill & Tool Corp., Chicago, Ill.
Robert H. Clark Co., Beverly Hills, Calif.
Cleveland Cutter & Ream. Co., Cleveland, O.
Cleveland Twist Drill Co., Cleveland, O.
Cogsdill Twist Drill Co., Inc., Oak Park, Mich.
Mailing Address — P.O. Box 97
College Pk. Sta., Detroit 21, Mich.
Cole Carbide Industries, Royal Oak, Mich.
Contour Grinding Co., Detroit 13, Mich.
Cooper-Bessemer Corp., Mt. Vernon, O.
Cornell Tool Co., Centerline, Mich.
Corundum Co., Inc., Cleveland 13, O.
Arthur A. Crafts Co., Inc., Chicago, Ill.
A. A. Crafts Co., Detroit, Mich.
Arthur A. Crafts Co., Inc., Boston, Mass.
Criterion Mach. Wks., Beverly Hills, Calif.
Czarnek & Czarnek Mfg., Georgetown, Ky.
Davis Boring Tool Co., St. Louis, Mo.
Dawson Carbide Indus., E. Detroit, Mich.
Detroit Boring Bar Co., Detroit, Mich.
Henry Disston & Sons, Inc., Philadelphia, Pa.
Eastern Tool Co., East Hartford, Conn.
Eclipse Counterbore Co., Ferndale 20, Mich.
Erie Industrial Supply Co., Erie, Pa.
Ex-Cell-O Corp., Detroit, Mich.
Fastcut Tool Co., Ferndale 20, Mich.
The Fellows Gear Shaper Co., Springfield, Vt.
M. A. Ford Mfg. Co., Inc., Davenport, Iowa
Formercraft Tool Co., Detroit 4, Mich.
C. J. Forthman, Cincinnati, O.
Gairing Tool Co., Detroit 32, Mich.
Gem Tool Co., Milwaukee, Wis.
General Tool & Die Co., E. Orange, N. J.
Genessee Tool Co., Fenton, Mich.
Glern & Anholtt Tool Co., Detroit, Mich.
Goddard & Goddard Co., Detroit 23, Mich.
Gorham Tool Co., Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
The Grind-Rite Tool Co., Inc., Berkley, Mich.
Harrington Tool Co., Detroit 4, Mich.
Hartley Wire Die Co., Thomaston, Conn.
Highland Carbide Tool Co., Irwin, Pa.
Illinois Tool Works, Chicago, Ill.
Ingersoll Milling Mach. Co., Rockford, Ill.
Jansson Gage Co., Detroit 27, Mich.
Charles L. Jarvis Co., Middletown, Conn.
Kearney & Trecker Corp., Milwaukee, Wis.
Kelly Reamer Co., Cleveland, O.
H. R. Krueger & Co., Detroit 11, Mich.
Lake Shore Tool Wks., Div., Carbide Tool Co., Chicago, Ill.
Lincoln Park Indus., Inc., Lincoln Park, Mich.
Lovejoy Tool Co., Inc., Springfield, Vt.
Lowell & Grayson, Tung-Tip Division, P.O. Box 88, Monrovia, Calif.
McCrosky Tool Corp., Meadville, Pa.
M & M Tool Co., Farmington, Mich.
Madison Mfg., Co., Muskegon, Mich.
Mason Tool & Die Co., Detroit 26, Mich.
The Ohio Knife Co., Cincinnati, O.
O. K. Tool Co., Shelton, Conn.
Onsrud Machine Works, Inc., Chicago 47, Ill.
Perfex Gage & Tool Co., Detroit 12, Mich.
Plan-O-Mill Corp., Hazel Park, Mich.
J. S. Popper, Inc., Union City, N. J.
Pratt & Whitney Div., Niles-Bement Pond Co., Hartford, Conn.
Precision Boring Tool Co., Lansing, Mich.
The Precision Tool Co., Muskegon, Mich.
Production Tool Co. of Amer., Detroit, Mich.
R & D Tool Co., Farmington, Mich.
Reeder Carbide Tool Co., Detroit, Mich.
Sandstrom Carbide Prod., Providence 7, R.I.
Savage Tool Co., Savage, Minn.
Clarence F. Schmarje Co., Muscatine, Iowa
Scully-Jones & Co., Chicago, Ill.
Service Carbide Tool Co., Ferndale, Mich.
Severance Tool Ind., Inc., Saginaw, Mich.
Sheffield Corp., Dayton, O.
Shepherd Car. Tool Co., Indianapolis 14, Ind.
Simonds Saw & Steel Co., Fitchburg, Mass.
Landon P. Smith, Inc., Irvington, N. J.
Sommer & Maca Glass Mach. Corp., Chicago, Ill.
Sprague & Henwood, Inc., Scranton, Pa.
Standard Gage Co., Inc., Poughkeepsie, N.Y.
Staples Tool & Eng. Co., Cincinnati 25, O.
Star Cutter Co., Detroit 27, Mich
L. S. Starrett Co., Athol, Mass.
State Mfg. & Const. Co., Franklin, O.
Super Tool Co., Detroit, Mich.
Swedish Gage Co. of Amer., Detroit 4, Mich.
Taft-Pierce Mfg. Co., Woonsocket, R. I.
Tool Specialty Co., Los Angeles, Calif.
Tungsten Carbide Tool Co., Detroit, Mich.
Universal Eng. Co., Frankenmuth, Mich.
Van Keuren Co., Boston, Mass.
Vinco Corp. (Gage Div.) Detroit 27, Mich.
Harry W. Wagner Co., Stamford, Conn.
Walken Tool Co., Cleveland, O.
Weddell Tools, Inc., Rochester, N. Y.
Welch Ind. Car. Div., Inc., Detroit 19, Mich.
The Weldon Tool Co., Cleveland 4, O.
Wendt-Sonis Co., Hannibal, Mo.
Metal Cutting Tools Inc., Division W. F. John Barnes Co., Rockford, Ill.
Metro Tool & Gage Co., Chicago, Ill.
Michigan Tool Co., Detroit 12, Mich.
Mid-West Tool & Mfg. Co., Detroit, Mich.
Minnesota Tool & Mfg. Corp., Minneapolis 8, Minn.
Modern Corp., Detroit 3, Mich.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Moslo Machinery Co., Cleveland, O.
Motor Tool Mfg. Co., Detroit, Mich.
National Tool Co., Inc., Cleveland, O.
Nelco Tool Co., Brooklyn 31, N. Y.
National Tool Salvage Co., Detroit 10, Mich.
New England Carbide Tool Co., Inc. Cambridge, Mass.
Wesson Co., Ferndale 20, Mich.
Wetmore Reamer Co., Milwaukee, Wis.
N. A. Woodworth Co., Detroit 20, Mich.

Michigan Wire Die Co., Detroit, Mich.
W. W. Mildrum Jewel Co., E. Berlin, Conn.
National Machinery Co., Tiffin, O.

What's a "Hog-Knife"?

WE WERE stumped, too! Our best guess was something that cuts pork chops on the hoof (but we were wrong!).

The odds are that your production doesn't require the use of a "hog-knife" but if so, it's available through at least one of the manufacturers listed here.

Producing hundreds of diversified tools, cutters, gages and special parts for use throughout industry, 134 manufacturers to date have been appointed to supply their products equipped with Carboloy Cemented Carbide.

They offer you the benefit of a highly specialized knowledge of their own product *plus* the "know-how" on the application of Carboloy Cemented Carbide to those products.

Call on these leading manufacturers for expert assistance. And for top performance, —specify "Tipped with Carboloy Cemented Carbide".

CARBOLOY COMPANY, INC.
11147 E. 8 Mile Road Detroit 32, Michigan
CHICAGO • CLEVELAND • HOUSTON • LOS ANGELES • MILWAUKEE • NEWARK • PHILADELPHIA
PITTSBURGH • THOMASTON

STANDARD **CARBOLOY** TOOLS
(TRADE MARK) CEMENTED CARBIDES

Stops which limit the forward movements of the drill spindles can be set to bear against the end of the work, and so hold the centering depth to a predetermined dimension; or they can be reversed so that they engage lugs on the drill-head casting. This insures that the center holes will be located the same distance apart, regardless of variations in work length.

The machine is supplied with change-gears which provide four different camshaft speeds of 2.9, 4.3, 6.1, and 9 cycles per minute. Two sets of collets—3/10 and 7/16 inch—are provided, while other sizes are available on special order. The machine occupies a floor space of 72 by 34 inches, is 54 inches high, and weighs approximately 2000 pounds. 71

Van Norman Horizontal Milling Machine

A No. 2 heavy milling machine designed for a wide range of production and general-purpose milling applications has been brought out by the Van Norman Co., Springfield 7, Mass. New engineering features have been incorporated in this machine, and every part has been designed for faster, easier operation, and greater accuracy.

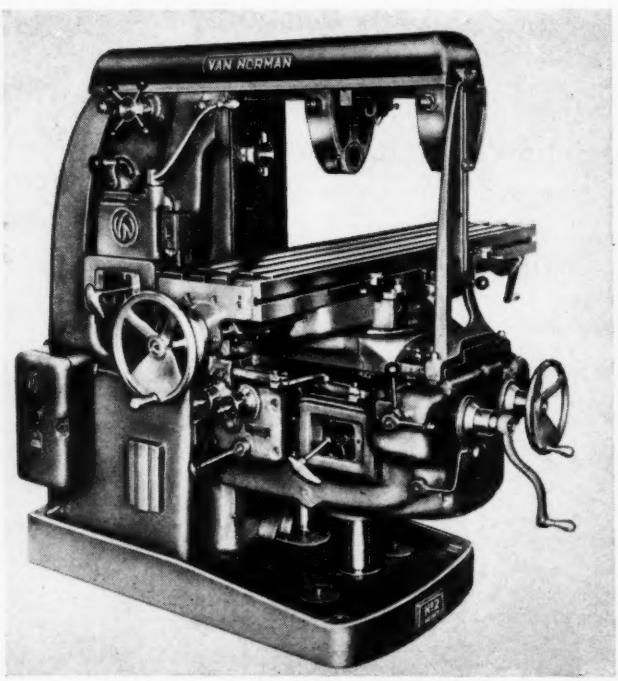
One of the important new features of this machine is the heavy large-diameter flywheel mounted on the inside of the column, which assures a smooth, uniform drive for the cutter. The cutter-spindle is of exceptionally large diameter, and is mounted in double opposed Timken bearings at the front end, double Timken bearings at the center, and straight roller bearings at the rear end. The drive-spindle has wide-faced hardened alloy-steel gears mounted on multi-splined shafts.

Front and rear directional controls for all power feeds permit operation of the machine from either the front or rear position. Manual hand-feeds both at the front and rear also facilitate operation. Single lever speed and feed selectors provide quick, easy control over the eighteen speeds, which range from 30 to 1500 R.P.M., and the eighteen feeds, which range from 3/8 inch to 32 inches. The spindle control lever can be easily operated from either the front or rear position. Safety devices in the knee serve to eliminate strain on any unit of the machine should overloading of the feed mechanism occur. Large-diameter feed-screw, automatic lubrication, hardened alloy-steel gears and shafts, large dials graduated in thousandths and multi-spline shafts operating in anti-friction bearings are outstanding features of this machine.

The machine table is 58 by 13 inches, and has a longitudinal movement of 28 inches, a crosswise movement of 10 inches, and a vertical movement of 17 inches. The driving motor is of 7 1/2 H. P. The machine is available with plain or universal saddle, the latter permitting the table to be swiveled 45 degrees to right or left. The plain machine weighs 6000, and the universal machine 6100 pounds. 72

Hardinge Precision Lathe

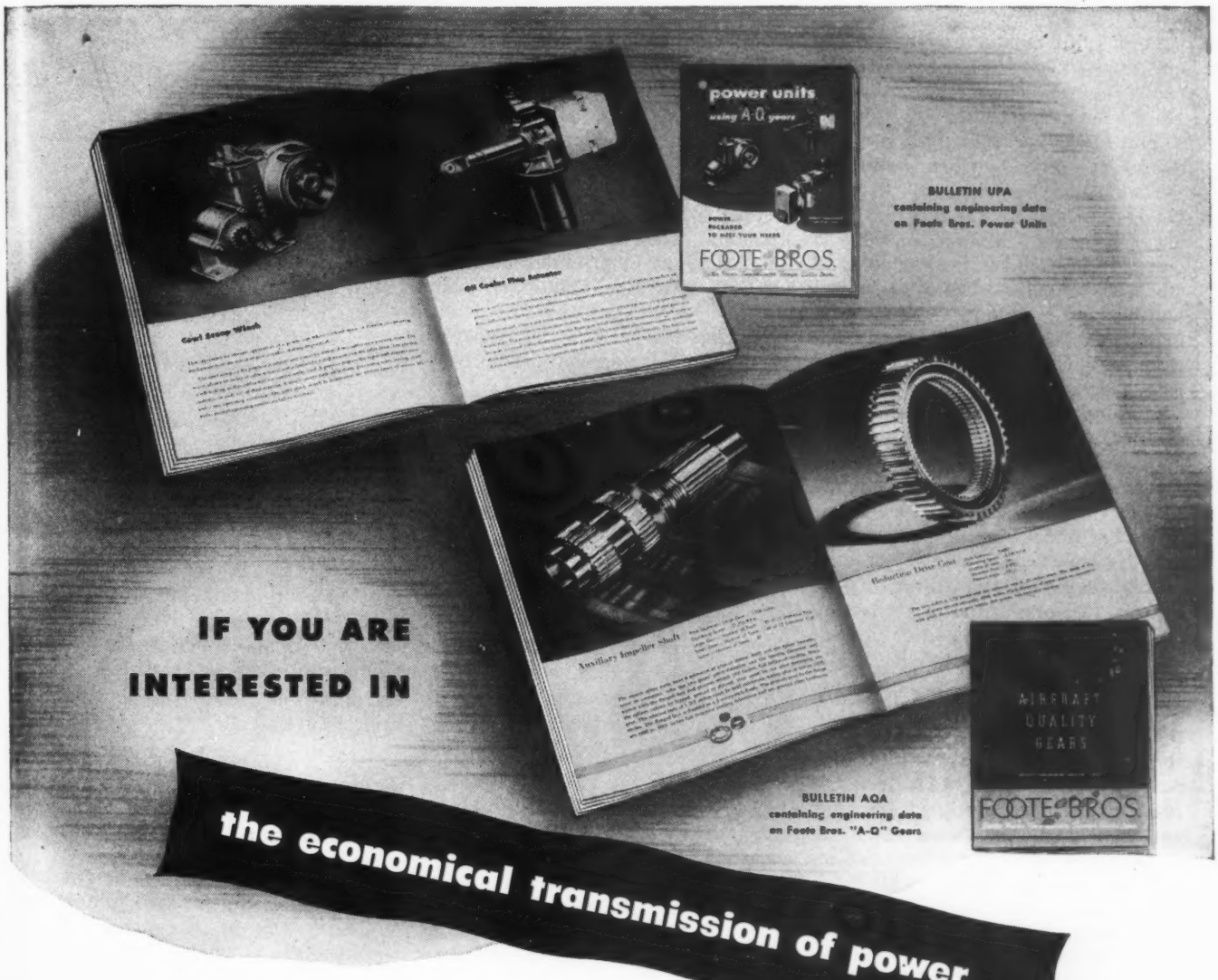
Hardinge Brothers, Inc., Elmira, N. Y., have developed a new model DV59 high-speed precision lathe for use in tool-rooms, laboratories, and production departments or wherever work must be machined to extremely close tolerances and finish specifications. This lathe embodies all the features of the Hardinge precision lathe line, in addition to the new features here described. The steel bed ways are of the new improved dovetail design. They are hardened and



Van Norman Milling Machine Designed for Wide Range of Work

High-speed Precision Lathe Developed by Hardinge Brothers, Inc.

To obtain additional information on equipment described on this page, see lower part of page 184.



. . . you will want copies of these books!

Bulletin UPA for the first time gives engineering data on a newly developed approach to power transmission. In this bulletin are shown compact Power Units. These "packages of power" assure absolutely correct mounting of gears, so essential to efficient operation, particularly when the gears are of high precision. Their design incorporates "A-Q" gears, described below.

Bulletin AQA gives complete engineering information on the design and application of "A-Q" (aircraft quality) gears. These new gears assure greater mechanical efficiency, longer life, lighter weight, more compact design and quieter operation.

These gears embody advance techniques in design and manufacture that permit operation at higher speeds and make possible loadings far in excess of values customarily considered safe design. By incorporating them in the machines you manufacture, your engineers may be able to solve difficult problems now confronting them—may be able to improve the performance of these machines and may be able to reduce over-all costs.

These books should be in the hands of every designing engineer or manufacturer interested in equipment requiring the transmission of power. Check the coupon and mail it today.

FOOTE BROS. GEAR AND MACHINE CORPORATION • 5225 South Western Blvd., Chicago 9, Ill.

FOOTE BROS.

Better Power Transmission Through Better Gears

Foote Bros. Gear and Machine Corporation
Dept. P 5225 S. Western Blvd.
Chicago 9, Ill.

Gentlemen:
Please send me Bulletins checked below.

☐ Bulletin UPA on Foote Bros. Power Units

☐ Bulletin AQA on Aircraft Quality Gears

Name.....

Position.....

Firm.....

Address.....

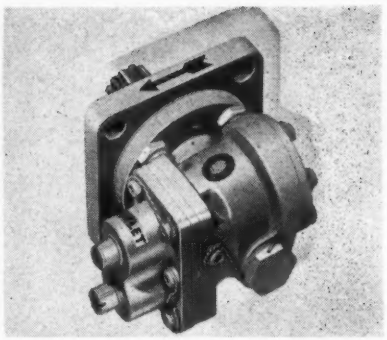
City.....*State*.....

ground to fit master gages, and are designed to assure sustained accuracy and precision interchangeability of attachments.

The lathe bed has a three-point mounting on the welded steel pedestal base. This mounting insures the maintenance of original bed accuracy even when the machine is placed on an uneven floor. The fully enclosed headstock has a preloaded ball-bearing spindle which is ground to take standard 1-inch capacity 5C Hardinge collets and 6-inch capacity step type chucks. The spindle is supplied with either the Hardinge standard taper nose or standard threaded nose for the direct application of step chuck closers, jaw chucks, and faceplates. The headstock spindle is belt-driven, the "center drive" pulley located between the spindle bearings providing equal distribution of belt pull. The "center drive" belt can be easily replaced without removing any part of the machine.

The new compound slide-rest of this lathe is securely anchored to the dovetail bed ways by a patented positive lock. This lock affords rapid positioning of the rest on the ways. The index slide has a hardened and ground steel section for wear resistance. All feed-screws are hardened and mounted in preloaded ball bearings to insure long life and sensitive operation. The index-slide can be swiveled through 360 degrees. The large feed-screw dials are graduated in thousandths of an inch.

The graduated steel pedestal base fully encloses the driving unit and tool storage compartment. The front of the pedestal base is designed to provide adequate knee and leg room, and there is an adjustable foot-rest. Built-in electrical equipment provides magnetic control, with stop and start push-button operating on 110 volts. Time lag thermal relays provide overload and low-voltage protection. 73



McIntyre Gear Type Pressure Lubrication Pump

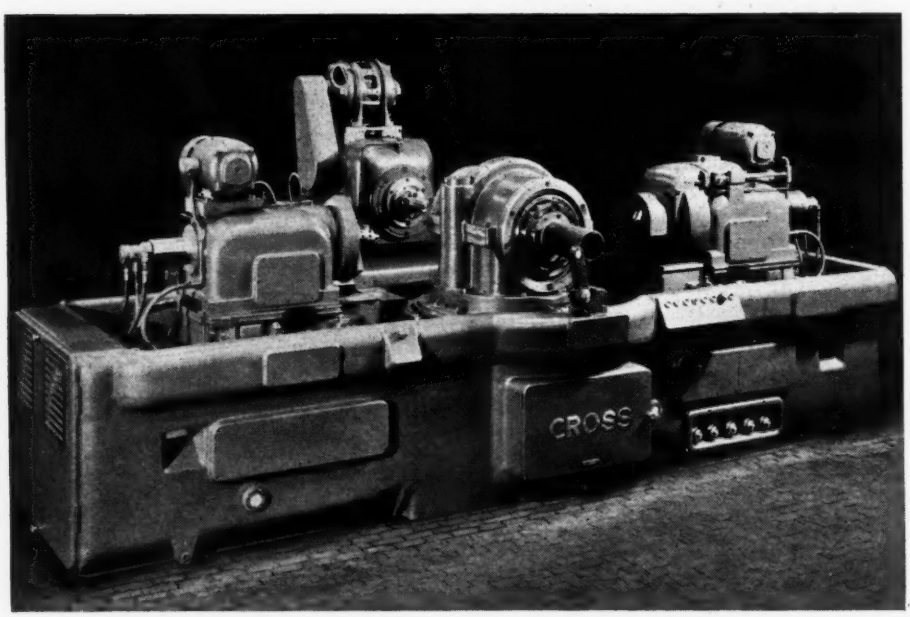
McIntyre Pressure Lubrication Pump

A gear type pressure lubrication pump, designated Series 400, which is available in eight standard models to displace from 1 1/4 to 20 quarts of lubricating oil per hour at 3000 R.P.M. against pressures up to 75 pounds per square inch is being introduced on the market by the McIntyre Co., 15 Riverdale Ave., Newton 58, Mass. This small pump, originally developed during wartime for aircraft applications, is of light-weight construction and operates with high volumetric efficiency. Standard models are supplied for flange mounting, and can be furnished for direct motor, belt, spline, and other standard drives. 74

Cross Special Boring, Facing, and Thread Milling Machine

Taper thread milling and precision boring and facing operations are automatically performed on heat-treated alloy-steel oil-tool joints with a special machine recently developed by the Cross Co., Detroit 7, Mich. This machine is designed to chuck two joints at opposite ends of a central work-holding fixture which has provision for rotating the work when milling the 6-pitch taper threads. The boring and facing operations are performed simultaneously at the two other stations of the fixture.

Operating features include power automatic indexing; location and clamping of the work, which is held stationary at stations 1 and 3; automatic work rotation at station 2; rough and finish taper thread milling, with electrically controlled operating cycle arranged for automatic precision resetting of the cutter for the second and finishing cut. 75

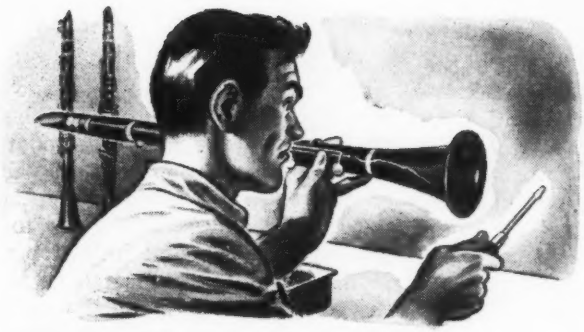


Special Boring, Facing, and Thread Milling Machine Developed by the Cross Co.

Tungsten-Carbide Thread Plug Gages

A complete range of tungsten-carbide thread plug gages, both standard and special, has just been announced to the trade by the

To obtain additional information on equipment described on this page, see lower part of page 184.

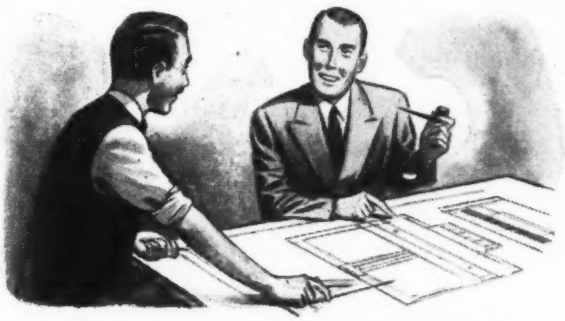


TUNES OUT TROUBLE

When slotted screws were used by this musical instrument maker, head breakage and driver skids damaged expensive assemblies – required disassembly, costly refinishing, and reassembly. A shift to Phillips Recessed Head Screws ended this trouble, permitted lower assembly costs.

SWING TO SAVINGS

Because the recessed head makes more efficient use of turning power, Phillips Screws can be set up tighter without danger of burring. As a result, fewer Phillips Screws are needed to make the rigid assembly required – a further saving in time and material.



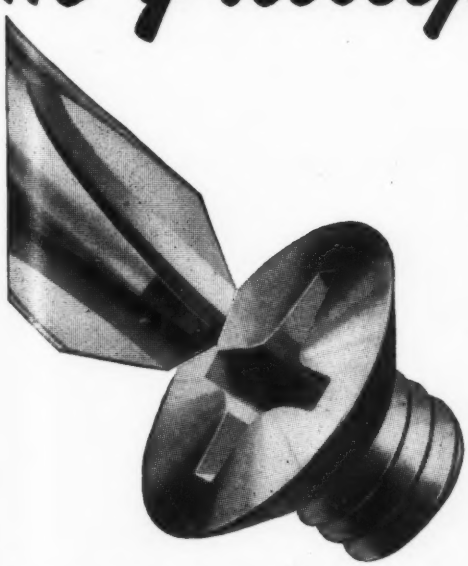
IN TIME WITH TOMORROW

Besides reducing costs and speeding up production, Phillips Screws help designers plan new, simpler methods of achieving strength, rigidity, and improved appearance. Result – a product in step with design trends – and a match for competition in tomorrow's tough markets.

SALES HIT HIGH NOTE

From the sales angle, Phillips Recessed Heads make fastenings a *feature!* No unsightly burrs to cool off prospects! The ornamental pattern of the Phillips Recess blends in harmony with modern design . . . helps start cash registers ringing a sweet sales symphony!

It's Phillips — the engineered recess!



In the Phillips Recess, mechanical principles are so correctly applied that every angle, plane, and dimension contributes fully to screw-driving efficiency.

. . . It's the exact pitch of the angles that eliminates driver skids.

. . . It's the engineered design of the 16 planes that makes it easy to apply full turning power – without reaming.

. . . It's the "just-right" depth of recess that enables Phillips Screw Heads to take heaviest driving pressures.

With such precise engineering, is it any wonder that Phillips Screws speed driving as much as 50% – cut costs correspondingly?

To give workers a chance to do their best, give them faster, easier-driving Phillips Recessed Head Screws. Plan Phillips Screws into your product now.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

Made in all sizes, types and head styles

25 SOURCES

American Screw Co., Providence, R. I.
Atlantic Screw Works, Hartford, Conn.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Manufacturers Screw Products, Chicago, Ill.
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
The Steel Company of Canada Ltd., Hamilton, Canada
Wolverine Bolt Co., Detroit, Mich.

Sheffield Corporation, Dayton 1, Ohio. All regular standard sizes are carried in stock, and other sizes are readily available.

Tungsten-carbide thread plug gages are normally used on high-production, close-tolerance jobs, their life being many times that of gages formerly used. Because of the extreme hardness of these tungsten-carbide gages, it is possible to produce parts to closer tolerances, since no allowance for wear is necessary. ----76

Plastics and Metal Testing Equipment

The Southwark Division of the Baldwin Locomotive Works, Philadelphia 42, Pa., has recently added to its line of equipment for testing molded plastics, plastic laminates, and wood the combination flexure tool and deflectometer shown in Fig. 1. The new instrument will make bending tests in accordance with the latest Federal specifications and those of the A.S.T.M., and will fit any testing machine.

The deflectometer measures the deflection from the center of the specimen and conveys this to an autographic stress-strain recorder, which traces the load deflection curve. One of the important features of this instrument is that it permits the operator to adjust the magnification of the deflection to 5, 10, 20, 50, 100, or 200 times. The high magnification ratio is used for very stiff and brittle materials that are deformed only slightly before breaking. The deflection is measured in terms of thousandths of an inch. The low magnification permits recording deflections as large as 2 inches.

To fill the need for a ram pacer in testing metals, plastics, and woods, when it is required that the testing loads be applied at certain and exact speeds, this company has brought out the device shown in Fig. 2, which can be attached to a hydraulic testing machine to provide control over the cross-head movements at eight preset speeds ranging from 0.01 to 1 inch per minute.

These speeds are obtained by gear changes on the synchronous motor-drive unit. This unit is attached to the fixed frame of the machine, while the dial portion of the apparatus is attached to the moving cross-head. The pointer sprocket wheel and the sprocket wheel on the drive unit are connected by an endless weighted chain. With the gear selected for a certain speed, the hydraulic valve of the testing machine is opened until the loading head rises to a point where the dial indicator remains stationary. This means that the pointer sprocket and the motor-driven sprocket below are moving at exactly the same speed.

This ram pacer is actually a combination tool, since it can also be used as a deflectometer. The dial is divided into 200 graduations of 0.001 inch each, and will indicate the deflection of a specimen under test. ----77

Optimus Rinsing and Drying Machine

A new machine designed especially for the rinsing and drying of screw machine or small stamped parts has been announced by the Optimus Equipment Co., 159 Church St., Matawan, N. J. This machine can be used for washing and drying or rinsing and drying, or for any one of these operations.

It is particularly suitable for difficult rinsing and drying jobs,

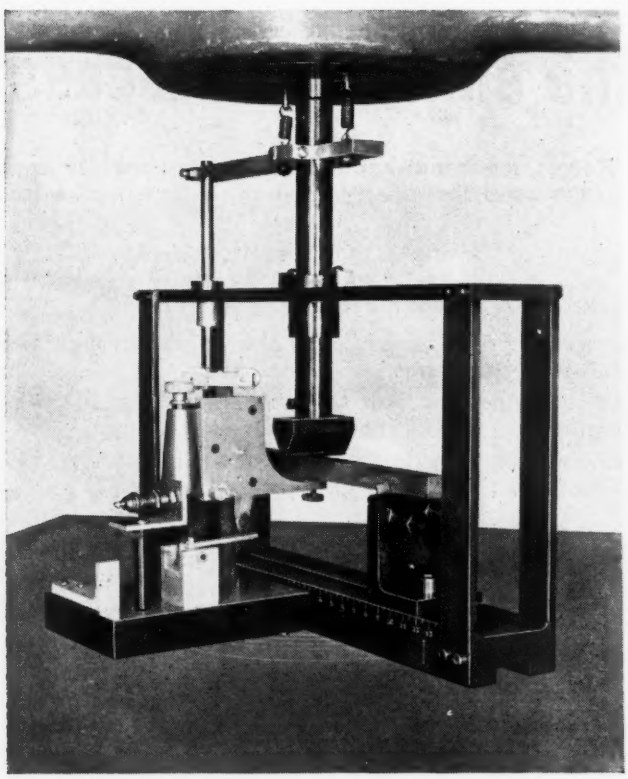


Fig. 1. Baldwin-Southwark Plastics Testing Instrument

Fig. 2. Testing Machine Equipped with Ram Pacer

To obtain additional information on equipment described on this page, see lower part of page 184.

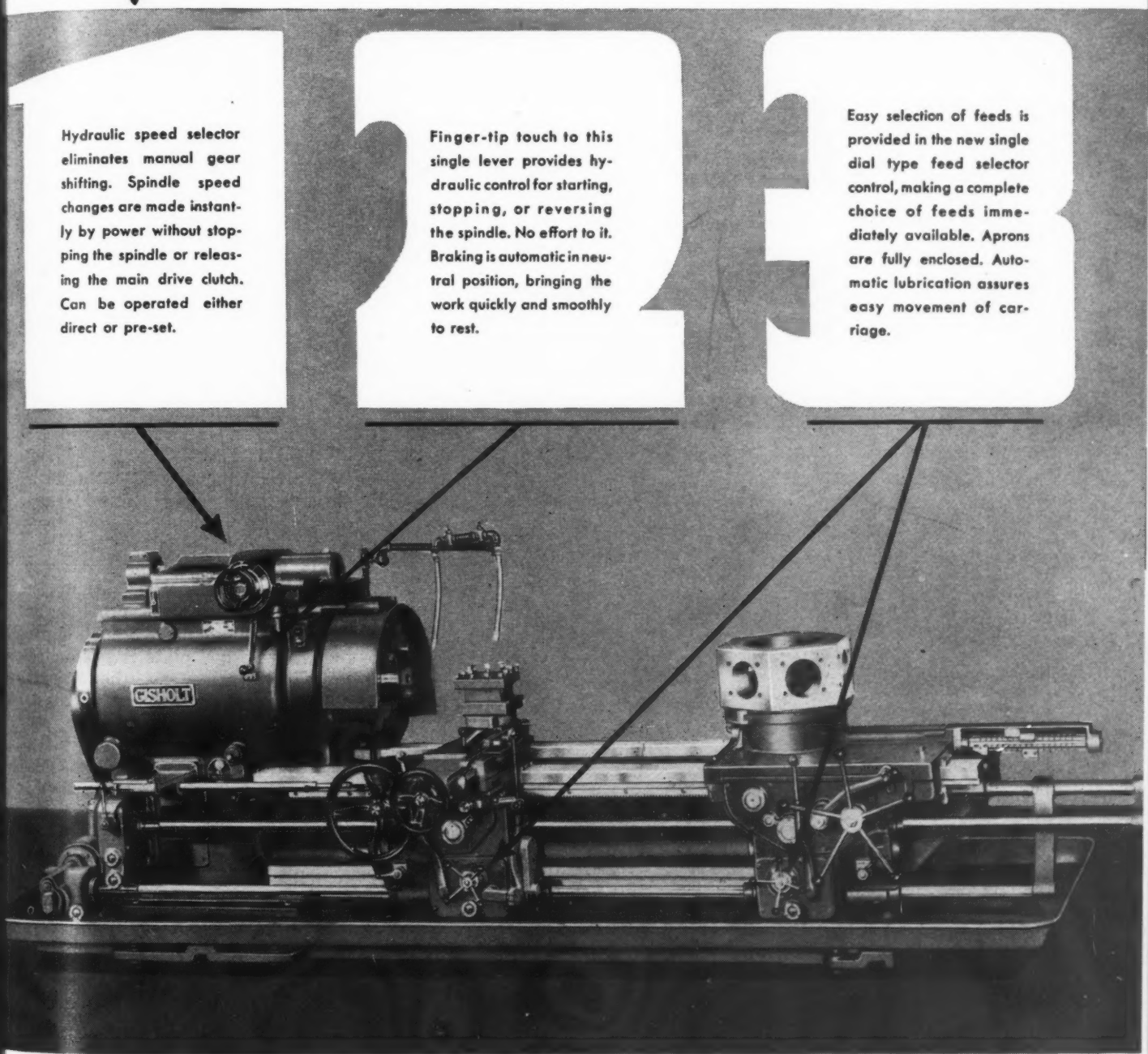
Easier Operation

HERE'S a 20,000-pound machine that requires no more operating effort than turret lathes approximately ⅓ its weight. Despite its great power and rigidity for heavy duty work, the new Gisholt 4L Saddle Type Turret Lathe is so fast and responsive it can handle light work of both large and small diameters. With many machine functions entirely automatic, waste time is eliminated. Fatigue is reduced to a new minimum. Training time is shortened. Operator output is faster—more nearly constant throughout the day.

1 Hydraulic speed selector eliminates manual gear shifting. Spindle speed changes are made instantly by power without stopping the spindle or releasing the main drive clutch. Can be operated either direct or pre-set.

2 Finger-tip touch to this single lever provides hydraulic control for starting, stopping, or reversing the spindle. No effort to it. Braking is automatic in neutral position, bringing the work quickly and smoothly to rest.

3 Easy selection of feeds is provided in the new single dial type feed selector control, making a complete choice of feeds immediately available. Aprons are fully enclosed. Automatic lubrication assures easy movement of carriage.



The new Gisholt 4L Saddle Type Turret Lathe provides 31⅜" swing over the ways; 27" swing over carriage wing and 63" longitudinal working travel of turret carriage to accommodate an unusually wide range of work. Ask Gisholt engineers about this modern, easier-operating Gisholt as applied to your specific machining requirements.

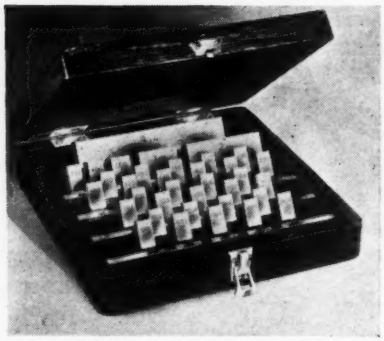
GISHOLT MACHINE COMPANY • 1209 *Washington Ave., Madison 3, Wis.*

Look Ahead...Keep Ahead...With Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

and can be employed for pickling operations. The air passes through a heater and blower, providing for either cold or hot air blast operation, or both. Air loss is eliminated by the completely enclosed drier end of the machine. The various parts of the machine are readily accessible for lubrication and maintenance. Centralized lubrication may be provided. 78



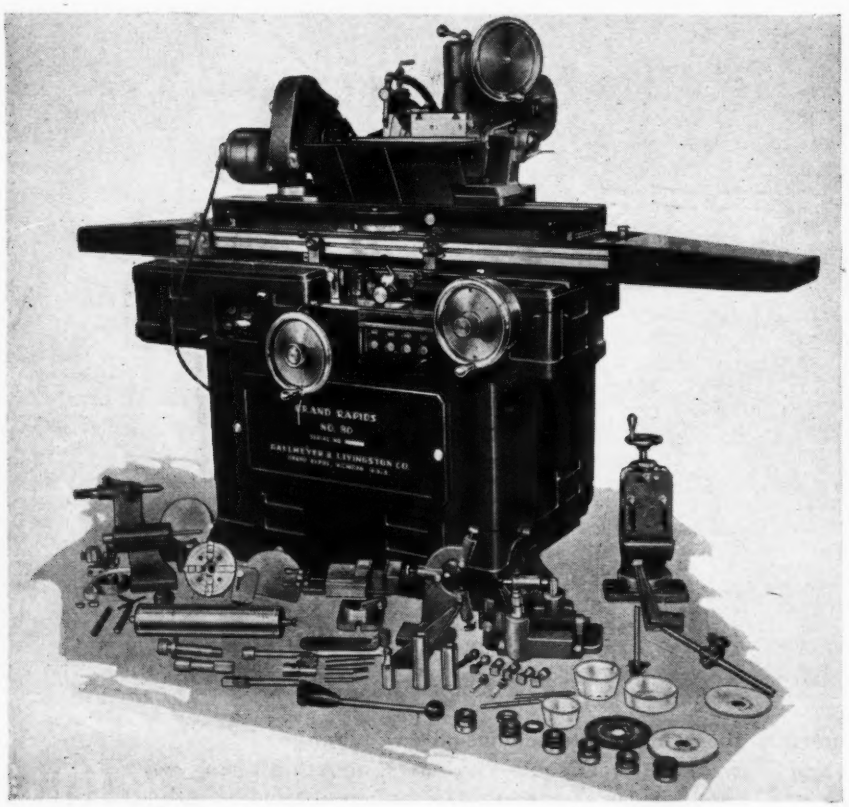
Fonda Gage-blocks Made of Tungsten Carbide

Fonda Carbide Gage-Blocks

A complete set of tungsten-carbide gage-blocks made to meet Bureau of Standards' requirements is now being offered for general use by the Fonda Gage Co., 53 Daly St., Stamford, Conn. These gage-blocks are manufactured in sets of thirty-five pieces ranging in size from 0.001 inch to 4 inches. The wear resistance of these blocks is said to be at least one hundred times greater than that of steel gage-blocks or ninety-eight times greater than chromium-plated blocks. The Fonda ultra-finish of 0.2 to 0.4 micro-inch r.m.s. of these gage-blocks is said to provide superior wringing qualities and to make them corrosion-proof against moisture or finger marks. 79

Grand Rapids Hydraulic-Feed Universal and Tool Grinders

The Gallmeyer & Livingston Co., 305 Straight Ave., S.W., Grand Rapids 4, Mich., has developed a new Grand Rapids hydraulic-feed universal and tool grinder which is being built in two sizes, No. 70 and No. 80. These two ruggedly constructed grinders are identical except that the table of the No. 80 machine is 6 by 50 inches and has a longitudinal movement of 32 inches, while the No. 70 machine is equipped with a 6- by 42-inch table having a longitudinal movement of 24 inches. The tables have an unlimited number of hydraulically operated speeds ranging from 4 inches to 50 feet per minute.



Grand Rapids Hydraulic-feed Universal and Tool Grinder with Attachments, Equipped for Wet Grinding

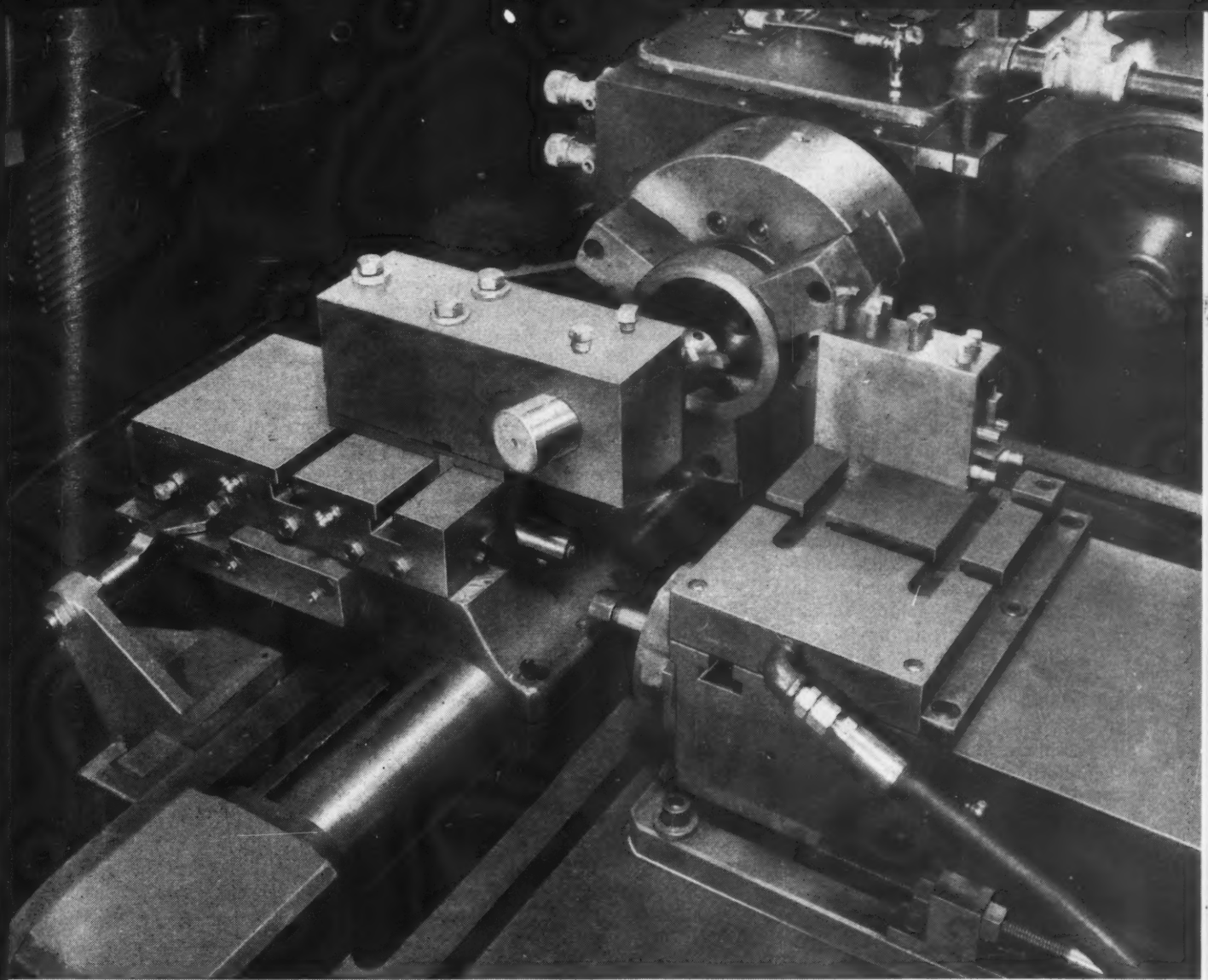
Ball bearings carried in Micarta retainers on carbon steel ways with hardened and ground tool-steel inserts insure easy movement of the tables by means of handwheels, which can be used on jobs for which the hydraulic table feed is not adapted. Both the No. 70 and the No. 80 grinders are obtainable with a motor-driven dust-collecting system when this is desired in preference to the coolant system, or the machines may be equipped with both systems.

These grinders have a swing diameter of 12 inches. The No. 70 machine has a swing length between the right- and left-hand tailstocks of 30 inches, while the No. 80 machine has a swing length of 38 inches. The cross-movement of the wheel is 10 1/2 inches, and the vertical movement of the spindle is 9 1/4 inches. The maximum distance from center line of spindle to top of table is 12 1/4 inches.

The table swings 90 degrees in either direction. Graduations on the end of the table provide for taper settings up to 3 inches per foot. The swivel plate is graduated to 180 degrees, and the spindle swivel movement is graduated to 360 degrees. Table traverse per revolution of the handwheel is 1/2 inch and 3 inches. Spindle speeds range from 2850 to 5800 R.P.M., and work speeds from 80 to 525 R.P.M. Internal spindle speeds from 9100 to 18,500 R.P.M. are available. The vertical and cross feeds have 0.001-inch graduations, while the fine cross-feed has 0.0001-inch graduations.

Five motors ranging from 1/4 to 3/4 H.P. are used to drive the spindle, hydraulic pump, workhead, coolant pump, and dust collector. The No. 70 machine requires a floor space of 100 1/2 by 57 inches and weighs 3500 pounds with standard equipment, while the No. 80 machine requires a floor space of 124 1/2 by 57 inches and weighs 3700 pounds. 80

To obtain additional information on equipment described on this page, see lower part of page 184.



Why this AUTOMATIC LATHE maintains *Greater Accuracy*

In the GISHOLT HYDRAULIC AUTOMATIC LATHE, feed pressures are applied directly to tools without intermediate cams, arms or other linkage. Accuracy is further insured by feeding against dead stops. In all cuts there is a moment of dwell during which cuts are cleaned up.

Front carriage is mounted on and driven by the massive bar to which it is clamped. Wide lateral support of carriage assures rigid alignment without tremble or tremor.

Movement of the massive rear slide is by hydraulic piston in the base of the slide itself.

Both carriages are directly supported by the massive integrally cast cabinet type bed and all bearing surfaces, ways and gibs are hardened and ground to assure permanent accuracy.

THE GISHOLT HYDRAULIC AUTOMATIC LATHE— *a genuinely rugged 12-inch lathe, also suited for light, fast jobs. Handles chucking between centers or fixture-held work.*

GISHOLT MACHINE COMPANY

1209 *East Washington Avenue* • *Madison 3, Wisconsin*

Look Ahead... Keep Ahead... With Gisholt Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

Sheffield Automatic Piston-Ring Checking Machine

The Sheffield Corporation, Dayton 1, Ohio, has brought out a gaging machine which is claimed to be the first ever built for the full automatic checking of piston-rings. This machine is designed for the use of piston-ring manufacturers and makers of automobile and aircraft engines. Gaging of the gap and periphery of the ring on this automatic machine is said to be accomplished much more accurately and at less cost than is possible by hand checking methods. The machine insures uniform quality of accepted parts, and positively classifies salvageable rings, thus lowering reworking costs. Electronic circuits, photo-electric cells, microswitches, solenoids, and relays incorporated in the machine actuate the gaging and selector devices.

The checking machine shown in the illustration is a single-purpose model, equipped for automatically checking oil-rings 0.108 inch thick and compression rings 1/8 inch thick, both of which have an outside diameter of 5.750 inches. The gap in these rings must be 0.070 inch wide within limits of plus or minus 0.0035 inch. The compression ring is tapered, while the oil-ring has a profile-formed periphery. The machine will check these rings at an average rate of 1500 per hour. It can be set up for other sizes and types of piston-rings by simply changing various elements. The inspection device can be set for any tolerance required.

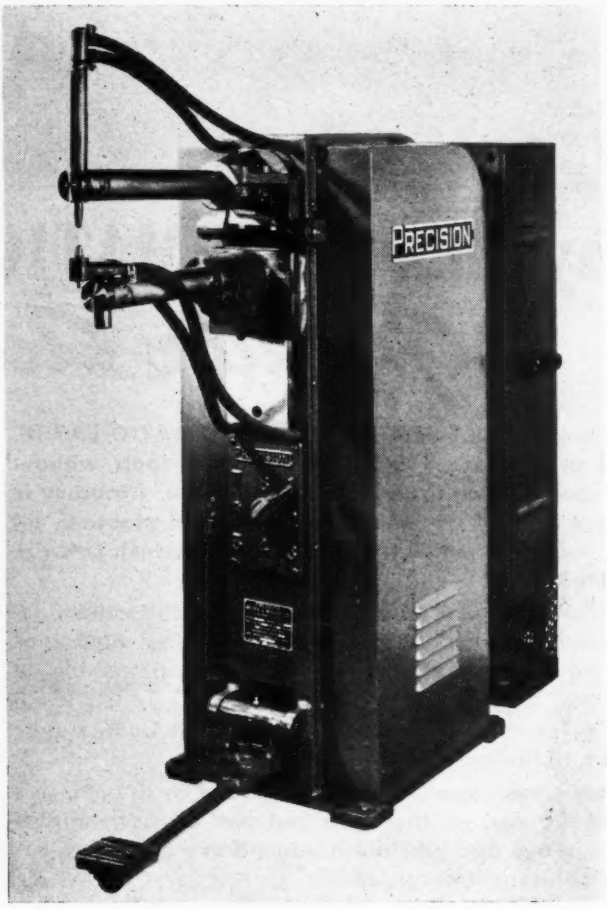
The machine segregates the piston-rings in three groups, the first having acceptable peripheries and gaps; the second having rejected gaps; and the third having peripheries that fail to meet requirements. The entire checking and separating operation is performed automatically, the operator only being required to load the rings into the feeding device.

Rings that are acceptable slide out the front of the machine into a rack, while rings that fail to pass the periphery or gap inspections fall into the rejection stations at the sides of the machine. A spring-loaded clutch throws the driving mechanism out of gear should the machine jam due to the piston-rings becoming laced together while being loaded into the feeding mechanism. ---------- 81

Foot-Operated Spot-Welder

The Precision Welder & Machine Co., English and Neave Sts., Cincinnati 4, Ohio, has developed a precision rocker-arm spot-welder provided with a unique foot-operated mechanism designed to provide high pressures with a minimum of operator effort. Welding pressures up to 400 pounds on the electrodes can be obtained by exerting a pressure of only 50 pounds. A minimum foot-treadle movement of 2 1/2 inches gives the electrode a travel of 1 1/4 inches. This move-

Sheffield Gaging Machine for Checking the Gap and Periphery of Piston-rings

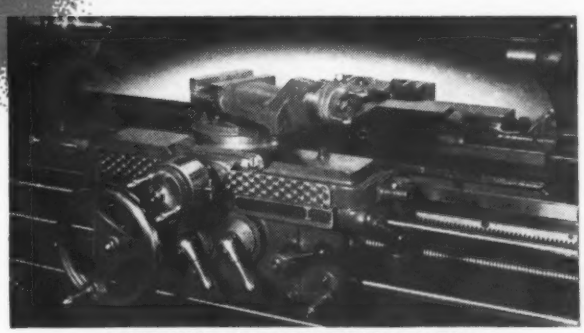


Foot-operated Spot-welder Made by the Precision Welder & Machine Co.

To obtain additional information on equipment described on this page, see lower part of page 184.

SIDNEY *Tool Room* LATHES

for your Precision Work



SIDNEY COMPOUND REST

The cross feed and compound screw are furnished with adjustable nuts and tapered gibs to compensate for backlash and wear—both are equipped with large micrometer dials. A micrometer stop on the cross feed provides an adjustable depth stop for turning or threading—and for internal and external thread chasing.

● Illustrated is a Sidney Tool Room Lathe machining close tolerance parts for aircraft.

The Sidney Tool Room Lathe is a well balanced precision tool designed with sufficient metal and proper distribution to assure rigidity and continued accuracy.

The continuous tooth Herringbone geared head not only provides a smooth flow of power but reduces backlash to practically nothing and assures smooth finish and accuracy. Centralized controls make for easy operation.

Its versatility and sturdy construction combine to give you dependable precision on a wide range of work.

Bulletins on all sizes available.

The
SIDNEY
MACHINE TOOL COMPANY
Builders of Precision Machinery
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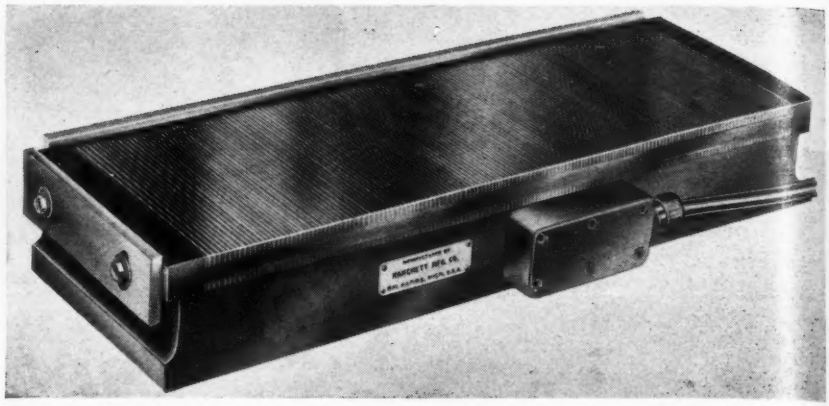
ESTABLISHED 1904

ment is adjustable to suit operating conditions.

Unit construction with removable side covers serves to keep maintenance costs at a minimum. The timer and contactor are mounted at the rear of the welder. Microswitch firing of the timer insures the application of pressure before the current begins to flow. 82



Magnetic Chuck with All-steel Top Made by Hanchett Mfg. Co.

Hanchett Magnetic Chuck with All-Steel Top Plate

A new magnetic chuck with a laminated top plate of all-steel construction has been added to the line of electromagnetic chucks made by the Hanchett Mfg. Co., Big Rapids, Mich. The pole sections of this chuck extend across the entire width of the top plate, the laminations being composed of magnetic steel pieces 1/8 inch thick and non-magnetic steel pieces 1/32 inch thick.

By utilizing the all-steel top-plate construction without brass or other metal, it is possible to harden the entire top plate, thus adding hundreds of production hours to the life of the separate top plate. Because of the close spacing of the pole pieces, the smallest parts can be held without difficulty. This construction also increases the area of the magnetic surface about 22 per cent.

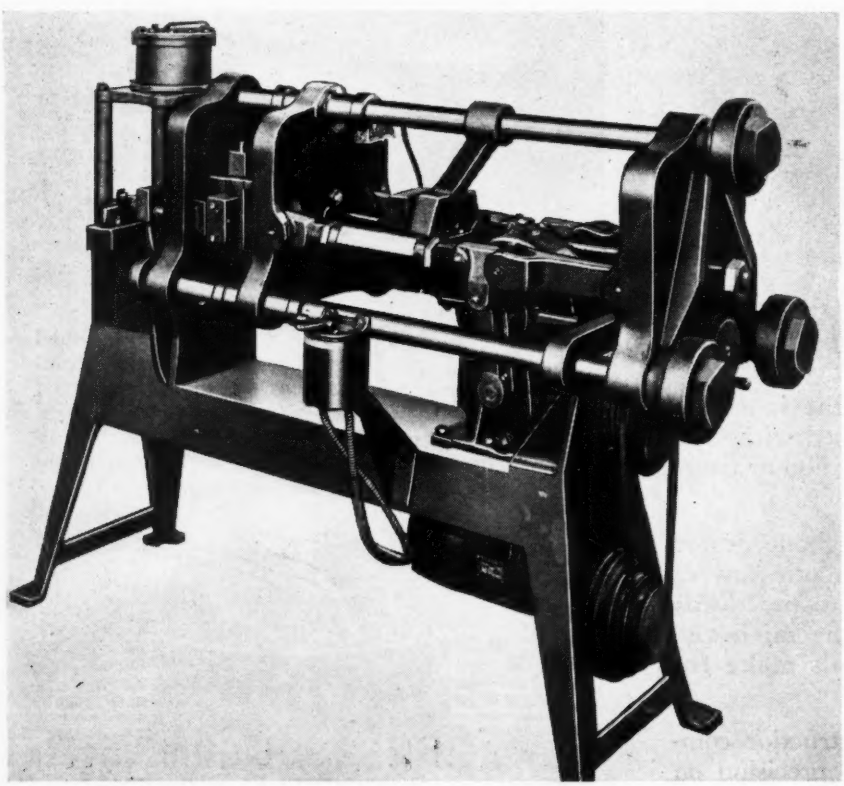
The electrical coils are carefully protected from moisture, so that the chuck can be operated under both wet and dry conditions. The crosswise arrangement of the coils in the chuck is said to reduce the possibility of work slippage. The new laminated top plate is now available in five sizes ranging from 6 by 18 inches up to 8 by 48 inches; other sizes will soon be available. 83

Die-Casting Machine Designed for Automatic Operation

A low-priced die-casting machine developed for the production of small zinc, tin, and lead alloy die-castings, which is designed to operate on a different principle from previous machines, is being built by Light Metal Machinery, Inc., 607 Ariel Bldg., Erie, Pa. The casting cycle of this machine is completely automatic, the die movement, injection, and ejection being accomplished by one simple mechanism. The machine has four operating speeds of 266, 400, 639, and 882 shots per hour, the speed selected being predetermined by the size and weight of the casting.

The extremely high operating speeds of this machine permit castings to be made in a single-cavity die at production rates said to be equal to and higher than those obtained on larger machines equipped with multiple-cavity dies.

The small light-weight dies used in this new machine can be easily installed and removed, reducing the die-changing time to fifteen minutes for the average dies. The cost and time consumed in making repairs and in doing other maintenance work are said to be very low, because the simple actuating mechanism subjects the machine parts to little wear and tear. The pressure-pot assembly can be removed and replaced in fifteen to twenty minutes. The injection plunger and cylinder assembly can be used for 300,000 shots before



Automatic Die-casting Machine Built by Light Metal Machinery, Inc.

To obtain additional information on equipment described on this page, see lower part of page 184.

J&L STEEL

Our metallurgical engineers will be glad to discuss your production problems with you.

JONES & LAUGHLIN
STEEL CORPORATION
PITTSBURGH 30, PENNSYLVANIA

SPECIAL COLD DRAWN SHAPES SAVE MACHINING

regrinding, and has in some cases withstood 1,000,000 shots.

This small compact machine can be operated in a space of 100 square feet. It can be operated with either air or hydraulic pressure on the injection plunger. The plunger of the standard model is 2 inches in diameter, has a stroke of 4 inches, and provides a shot capacity of 18 ounces. The casting area is 30 square inches, and the injection pressure is 1000 pounds per square inch when an air cylinder is used and 2000 pounds per square inch when a hydraulic cylinder is employed. Plungers of other sizes are available. The machine is 6 feet by 21 inches by 4 1/2 feet, and weighs 3000 pounds. 84

LeMaire Heavy-Duty Vertical Drilling Machine

The LeMaire Tool & Mfg. Co., 2657 S. Telegraph Road, Dearborn, Mich., has added to its line of vertical drilling machines a new No. 20 model, which is designed for accurate single- or multiple-spindle drilling and boring of extra heavy parts. It is furnished with a spindle having a milled driving slot for multiple-head adaptations. Provision is also made for a Morse taper adapter for use in single-spindle operations.

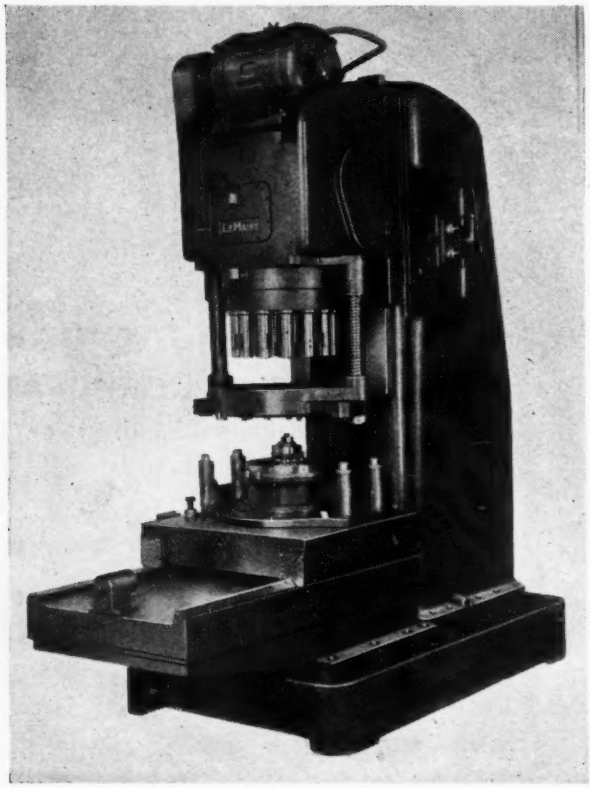
Rapid advance and feed of the head are obtained by means of a heavy-duty hydraulic cylinder mounted on the column between the ways and operated by a Vickers control panel. The illustration shows the machine equipped with fourteen spindles set to drill eight holes 17/32 inch in diameter and six holes 39/64 inch in diameter. While the part is still in the fixture, the 39/64-inch drills are replaced by six reamers for finishing these holes to a diameter of 0.6245 inch. Magic quick-change chucks are used to facilitate changing tools. This arrangement enables three operations to be performed without disturbing the original set-up, thus saving considerable time and increasing production.

The manually operated shuttle type fixture facilitates the loading and removal of the work with a hoist. A rigid box type table, 25 by 29 inches, is standard equipment. An indexing table, 42 inches in diameter, can be had for either manual or automatic operation at extra cost.

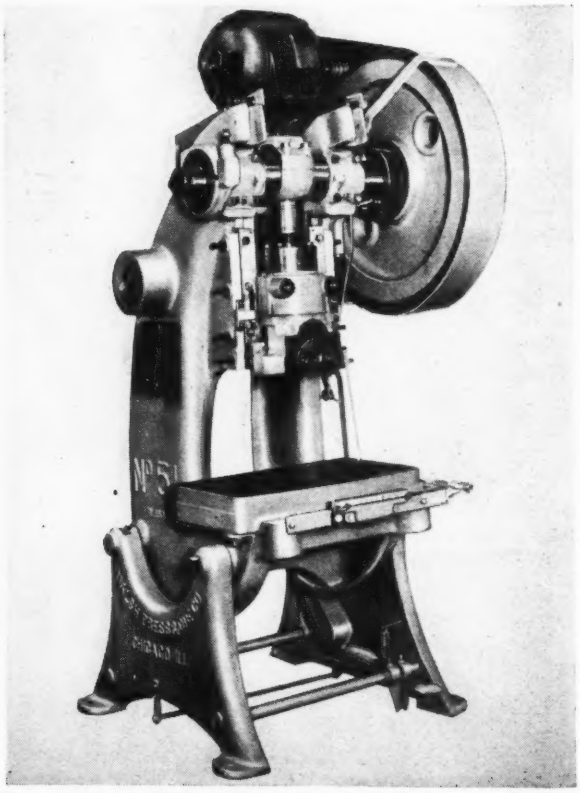
Power is transmitted by V-belts to a pick-off gear shaft and through the pick-off gears to a worm-wheel which drive the spindle. The spindle is mounted in double-row ball bearings at its upper end and in a double-row Timken roller bearing at its lower end. The gears and bearings in the driving head are lubricated by a splash system, and the sliding surfaces on the head are greased by the Alemite system. Automatic lubrication can be furnished at extra cost. 85

New Line of Punch Presses

The Walsh Press & Die Co. Division of American Machine & Gage Co., 4743 W. Kinzie St., Chicago, Ill., has placed on the market a complete, new line of punch presses having capacities ranging from 6 to 80 tons. All sizes have accurately ground forged-steel crankshafts, scraped bearings, solid web wheels, and gears. These presses are readily inclined to the desired operating angle, have an adjustable die-head, and are de-

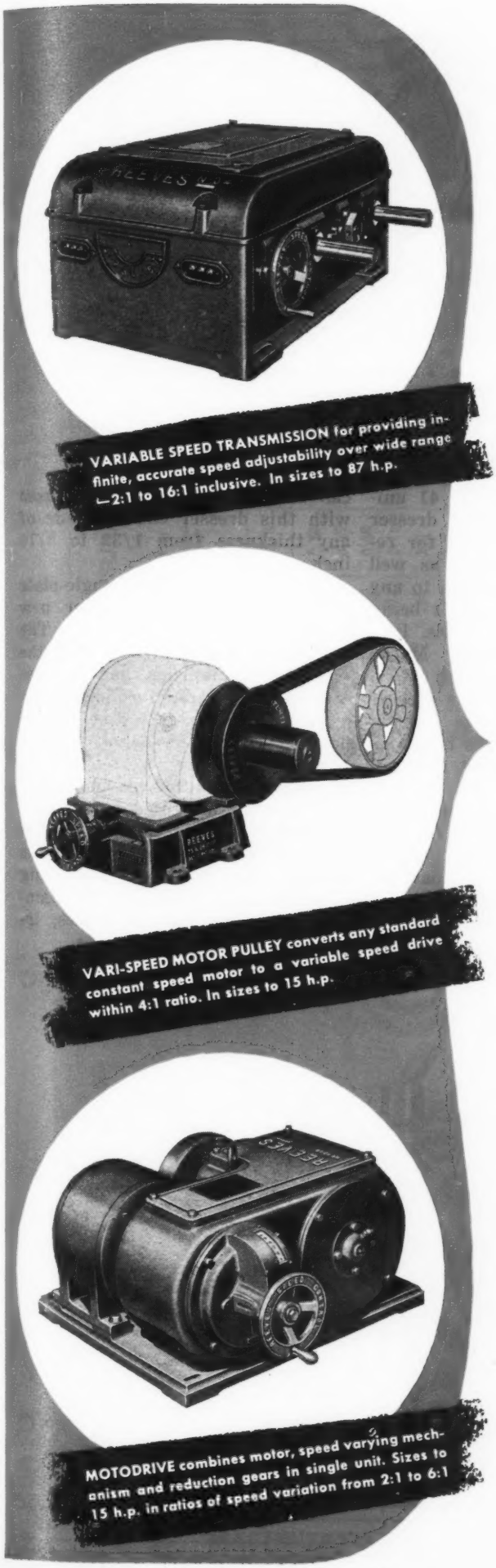


Vertical Type Heavy-duty Drilling Machine Brought out by LeMaire Tool & Mfg. Co.



Punch Press of New Line Made by Walsh Press & Die Division of American Machine & Gage Co.

To obtain additional information on equipment described on this page, see lower part of page 184.


VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed adjustability over wide range —2:1 to 16:1 inclusive. In sizes to 87 h.p.
VARI-SPEED MOTOR PULLEY converts any standard constant speed motor to a variable speed drive within 4:1 ratio. In sizes to 15 h.p.
MOTODRIVE combines motor, speed varying mechanism and reduction gears in single unit. Sizes to 15 h.p. in ratios of speed variation from 2:1 to 6:1

these 3 units

MADE INDUSTRY SPEED CONTROL MINDED

Stepless, variable speed control has proved itself such a big factor in faster, more accurate and more economical war production that manufacturers will never again be satisfied with machines with fixed speeds. And here, illustrated on this page, are the three basic REEVES Speed Control units which have had most to do with this important development. More than 300,000 REEVES units are now in service. They are standard equipment on 1,866 different makes of machines.

No other speed control offers so many sizes and types to choose from—is so fool-proof and reliable. No other has the nation-wide staff of representatives, so thoroughly trained in this specialized field of engineering. Look for the familiar REEVES handwheel on any new machine you buy. It is your assurance of greater versatility, uniform quality and larger output of production. Easily installed, too, on any driven machine in service. Write for Catalog M-450.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Speed Control Engineering

REEVES Speed Control

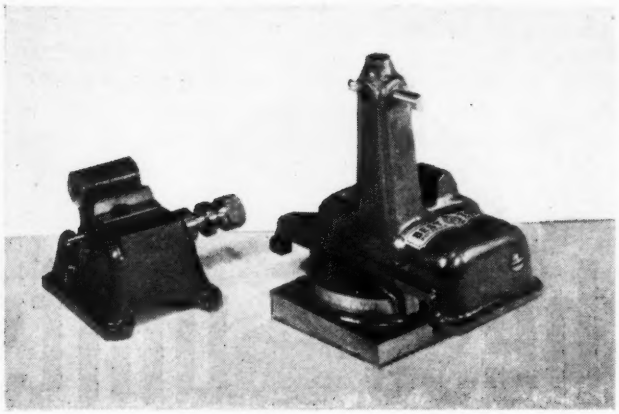


Fig. 1. Universal Grinding Wheel Dresser Made by Best Tools, Inc.

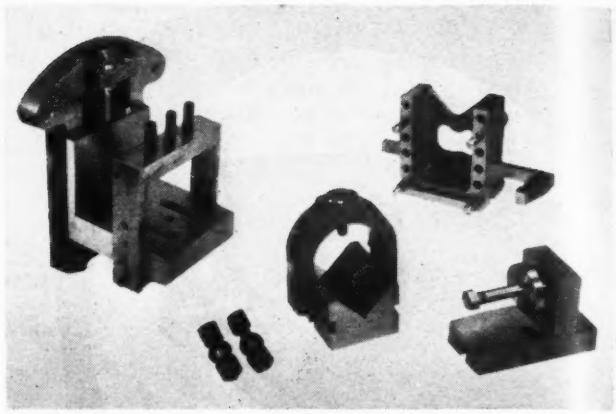


Fig. 2. Universal Lathe Angle-plate for Holding Irregular-shaped Work

signed for smooth, high-speed operation. A simple yet efficient two-button safety device is provided for the protection of operators. 86

Bellows-Senacon Drill Press Feed

A new "stepless range" power feed for use on drill presses, milling machines, surface grinders, etc., is being introduced to the trade by the Bellows Co., 861 E. Tallmadge Ave., Akron 10, Ohio. A slight pressure on the control handle of this feed advances the work or tool a predetermined distance under a predetermined power thrust and automatically returns it to the starting position. Simple, positive precision controls for feed and traverse rates, power thrust, and length of stroke are provided.

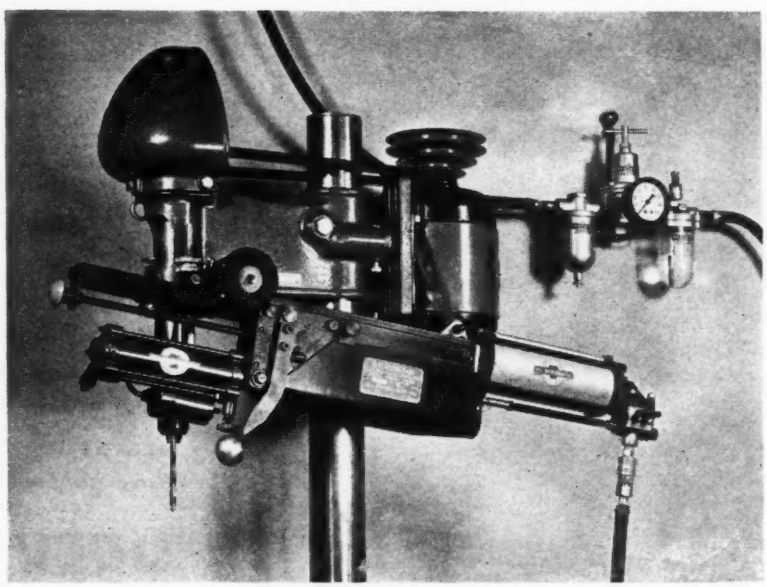
The feed is driven by a Bellows air motor which operates on any air pressure up to 160 pounds, delivering a power thrust approximately five times the operating air-line pressure. The feeding rate can be accurately adjusted to give the best results in drilling or machining any given material with the tool employed. Simple adjustment of two throttle valves permits stepless variation of the feed and retraction speed. The advance feed may be so slow that it is barely discernible, and the return feed as fast as desired.

The feeds are made in two sizes: Model DF-60 using a 6-inch stroke Bellows air motor; and Model DF-90 using a 9-inch stroke Bellows air motor. Standard equipment includes air-pressure regulator, gage, oiler, filter, hose, fittings, and quick coupler. 87

Grinding Wheel Dresser and Lathe Angle-Plate

The improved Type No. 41 universal grinding wheel dresser shown in Fig. 1, designed for reproducing templet forms, as well as forming grinding wheels to any required angle or radius, is being manufactured by Best Tools, Inc., and distributed solely by Madco Products, Inc., 516 Fifth Ave., New York 18, N. Y. This dresser will accurately reproduce templet forms up to 1 1/2 inches in length and angles of any degree, and will produce both convex and concave surfaces of any radius up to 1 inch. Its design provides for setting with size-blocks for radius dressing and with a sine bar for angle dressing when a higher degree of accuracy is required than can be obtained with the regular calibrated-base dial. Templets used with this dresser can be made of any thickness from 1/32 to 3/16 inch.

The universal lathe angle-plate shown in Fig. 2 is another new product of this company. The angle-plate is designed to take the place of special jigs and fixtures ordinarily required for holding irregular-shaped work that cannot be chucked in the usual manner. It is essentially a toolmaker's angle-plate, mounted on an adjustable base for attachment to a lathe faceplate. With the accessories shown in the illustration, it makes possible the precision machining of offset inside and outside diameters, bushing and die plates, irregular-shaped castings, etc.

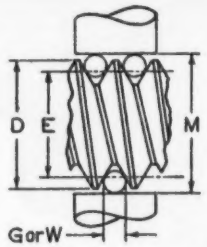


Bellows-Senacon Drill Press Feed

To obtain additional information on equipment described on this page, see lower part of page 184.

CONSTANTS FOR THREAD MEASUREMENT BY THREE-WIRE METHOD

American National Standard Thread Form



D = basic major diameter;
E = pitch diameter;
M = size over wires;
G = diameter of "best size" wire;
W = diameter of wire other than "best size";
A, B, C, and F = constants given in table below.

To find M when "best size" wire is employed, use either Formula (2) or (3). When other than "best size" wire is employed, use Formula (4) to find M.

$E = D - A$ (1) $\quad M = D + C$ (3)

$M = E + B$ (2) $\quad M = D - F + 3W$ (4)

N	A	B	C	F	G
Number of Threads	$\frac{0.64952}{N}$	$\frac{0.86603}{N}$	$\frac{0.86603}{4 \times N}$	$\frac{1.5155}{N}$	$\frac{0.57735}{N}$
4	0.16238	0.21651	0.05412	0.37887	0.14434
4 1/2	0.14434	0.19245	0.04811	0.33660	0.12830
5	0.12990	0.17321	0.04330	0.30310	0.11547
6	0.10825	0.14434	0.03608	0.25258	0.09623
7	0.09729	0.12372	0.03093	0.21650	0.08248
8	0.08119	0.10825	0.02706	0.18940	0.07217
9	0.07217	0.09622	0.02405	0.16838	0.06415
10	0.06495	0.08660	0.02165	0.15155	0.05774
11	0.05905	0.07873	0.01968	0.13770	0.05249
11 1/2	0.05648	0.07531	0.01883	0.13170	0.05020
12	0.05413	0.07217	0.01804	0.12629	0.04811
13	0.04996	0.06662	0.01665	0.11657	0.04441
14	0.04639	0.06186	0.01546	0.10825	0.04124
16	0.04059	0.05413	0.01353	0.09470	0.03608
18	0.03608	0.04811	0.01203	0.08420	0.03207
20	0.03248	0.04330	0.01082	0.07577	0.02887
24	0.02706	0.03608	0.00902	0.06310	0.02406
27	0.02406	0.03207	0.00802	0.05613	0.02138
28	0.02320	0.03093	0.00773	0.05412	0.02062
32	0.02030	0.02706	0.00676	0.04735	0.01804
36	0.01804	0.02406	0.00601	0.04210	0.01604
40	0.01624	0.02165	0.00541	0.03789	0.01443
44	0.01476	0.01968	0.00492	0.03444	0.01312
48	0.01353	0.01804	0.00451	0.03157	0.01203

MACHINERY'S Data Sheet No. 550, November, 1945

Compiled by John Cooper, Jr.
Trenton, N. J.

PRESSURE IN TONS REQUIRED TO PUNCH MILD STEEL PLATE

(Shearing Strength, 50,000 Pounds per Square Inch)

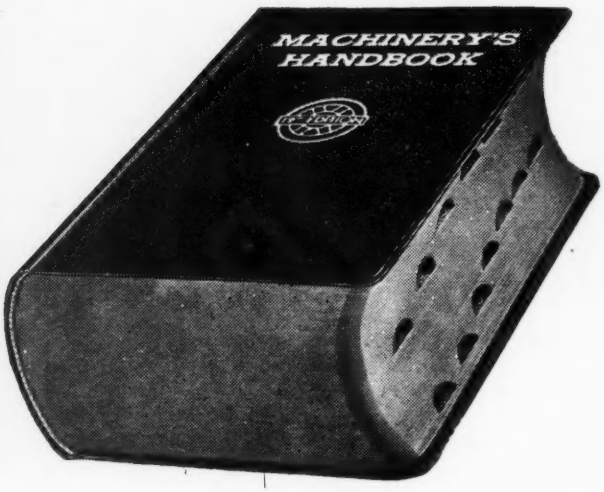
Thickness of Metal		Hole Diameter, Inch							
Gage	Inch	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16
20	0.036	0.35	0.53	0.71	0.88	1.1	1.2	1.4	1.6
18	0.048	0.47	0.71	0.94	1.2	1.4	1.7	1.9	2.1
16	0.060	0.59	0.89	1.2	1.5	1.8	2.1	2.4	2.7
14	0.075	0.74	1.1	1.5	1.9	2.2	2.6	2.9	3.3
12	0.105	1.0	1.6	2.1	2.6	3.1	3.6	4.1	4.7
11	0.120	1.2	1.8	2.4	3.0	3.5	4.1	4.7	5.3
10	0.135	....	2.0	2.7	3.3	4.0	4.6	5.3	6.0
3/16"	0.187	....	2.8	3.7	4.6	5.5	6.5	7.4	8.3
1/4"	0.250	....	....	4.9	6.2	7.4	8.6	9.8	11.0
3/8"	0.375	....	....	....	....	11.1	13.0	14.8	16.6
1/2"	0.500	....	....	....	....	....	17.2	19.7	22.1

Thickness of Metal		Hole Diameter, Inch						
Gage	Inch	5/8	11/16	3/4	13/16	7/8	15/16	1
20	0.036	1.8	1.9	2.1	2.3	2.5	2.7	2.8
18	0.048	2.4	2.6	2.8	3.1	3.3	3.5	3.8
16	0.060	2.9	3.2	3.5	3.8	4.1	4.4	4.7
14	0.075	3.7	4.1	4.4	4.8	5.2	5.5	5.9
12	0.105	5.2	5.7	6.2	6.7	7.2	7.7	8.3
11	0.120	5.9	6.5	7.1	7.7	8.3	8.8	9.4
10	0.135	6.6	7.3	8.0	8.6	9.3	10.0	10.6
3/16"	0.187	9.2	10.2	11.1	12.0	12.9	13.8	14.8
1/4"	0.250	12.3	13.5	14.8	16.0	17.2	18.5	19.7
3/8"	0.375	18.5	20.3	22.1	24.0	25.8	27.7	29.5
1/2"	0.500	24.6	27.1	29.5	32.0	34.4	36.9	39.4
5/8"	0.625	30.8	33.8	36.9	40.0	43.0	46.1	49.2
3/4"	0.750	....	....	44.3	48.0	51.7	55.4	59.0

Based on Experiments Conducted by the Cincinnati Shaper Co. (Republished by Permission)

MACHINERY'S Data Sheet No. 549, November, 1945

MACHINERY'S HANDBOOK



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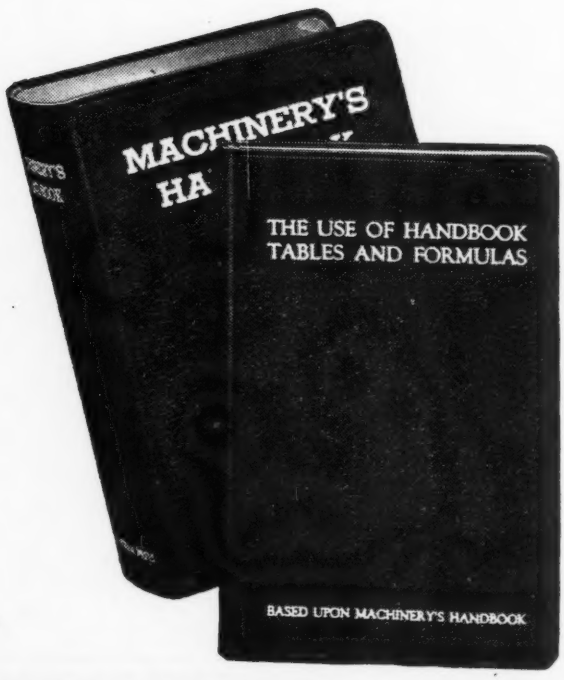
This companion book, which costs only $1, serves three purposes: It throws the spotlight on a lot of essential time-saving tables, rules and general information in MACHINERY'S Handbook that the ordinary user never discovers.

A second and equally important function is to show by examples, solutions and test questions, typical applications of handbook matter in both drafting rooms and machine shops. A third object is to provide test questions and drill work designed for use in technical schools and machine-shop training courses so that students will learn at the outset how to apply an engineering handbook.



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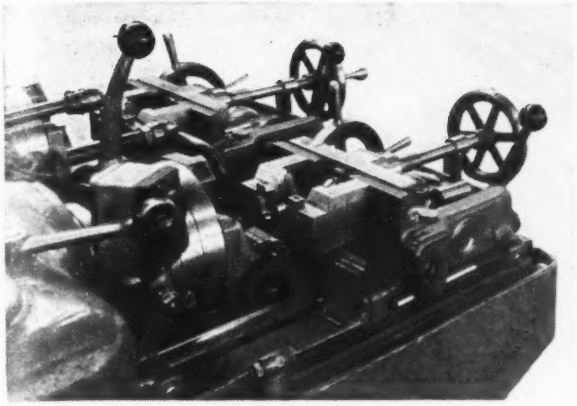
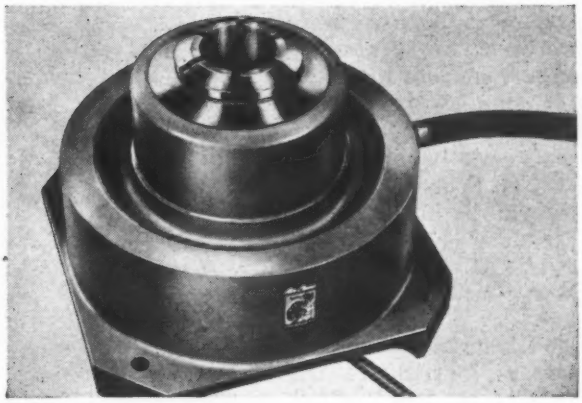


Special Chuck for Threading Hypoid Gears on Landmaco Threading Machine



Mead Air-actuated Collet Adapted for Second-operation Work

One of the accessories available with the angle-plate is a box-like fixture for holding plates, which is particularly useful when machining bushing and die plates. Another accessory is a large V-block and clamp designed to hold rounds up to 3 inches in diameter. A third accessory consists of a special indexing head which can be attached to the angle-plate by means of T-bolts. 88

Special Work-Holding Fixture for Landmaco

The Landis Machine Co., Waynesboro, Pa., has designed a special work-holding fixture for use in threading hypoid driving gears on the Landmaco machine. This fixture is designed to maintain the close tolerances required for concentricity between the gear and the thread.

The special work-holding fixture has a traveling center, located within the bore of the head and machine spindle, combined with a splined bushing for driving the work-piece. A manually operated work-center on the machine carriage, together with a cradle type support, locates the work for easy alignment with the work-supporting center.

The gear to be threaded is placed on the supporting bracket and advanced by means of the carriage-operating handwheel until the splined end of the gear shaft engages the splined sliding bushing and center within the bore of the head. A handwheel is then employed to advance the rear center to engage the gear end of the work. The complete chucking operation can be accomplished in a few moments' time. The work-supporting bracket or cradle is detachable from the machine carriage, and can be interchanged with other brackets designed to accommodate odd-shaped pieces. 89

Master Induction Heating Coil with Interchangeable Inserts

The Induction Heating Corporation, 389 Lafayette St., New York 3, N. Y., has recently developed a master coil with removable inserts designed to eliminate the problems of coil-changing in setting up equipment for various induction heating applications. These inserts can be changed in a matter of seconds, and are available in complete sets that will accommodate work diameters ranging from 1/8 inch to 3 inches.

The basic master coil consists of a rugged water-cooled inductor block machined to take the inserts that make up the actual coil. Used with a Thermonic output transformer, this new development gives, in effect, a single-turn inductor block of variable inside diameter. The inserts can be of any desired thickness, thus making the coils capable of heating axial bands of various widths. The inserts can also be used in multiple, thus offering the flexibility of many different coils of unusual contour.

The standard Thermonic master coil set consists of two master coils and forty-eight inserts contained in a specially constructed wood chest. 90

Mead Air Collet

A collet designed to open up a wider field of application for air power, especially for second operations, has been brought out by the Mead Specialties Co., Department P-26, 4120 N. Knox Ave., Chicago 41, Ill. This Model JC-2 collet will hold bar stock up to 2 1/2 inches in size with the same smooth tenacious grip as that applied by the smaller models.

When equipped with chucks, the collet will also handle shallow circular shapes up to 5 inches in di-

Master Induction Heating Coil and Inserts

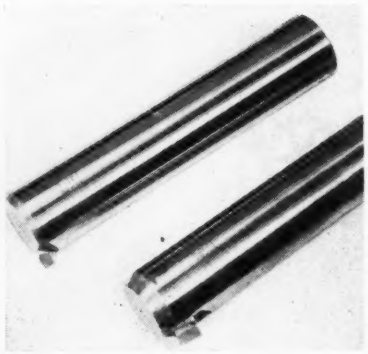
To obtain additional information on equipment described on this page, see lower part of page 184.

ameter. Like other Mead collets, this one can be used wet or dry. The coolant fountain issuing through the collet lubricates, cools, and washes away chips. A pressure reducer can be employed to insure gentle handling of the delicate parts. Foot-pedal control leaves the operator's hands free. 91

Tri-Bit Boring-Bars

The triangular-shaped tool bits known as "Tri-Bits," which are manufactured by Weddell Tools, Inc., 1985 Main St., East, Rochester 9, N. Y., have been applied to boring-bars. In these bars one or more Tri-Bits are fitted into triangular holes, tying the body together around the blade. The triangular tool bit is locked securely into a V-seat by a single clamping screw, and is backed up and accurately adjusted by a single screw.

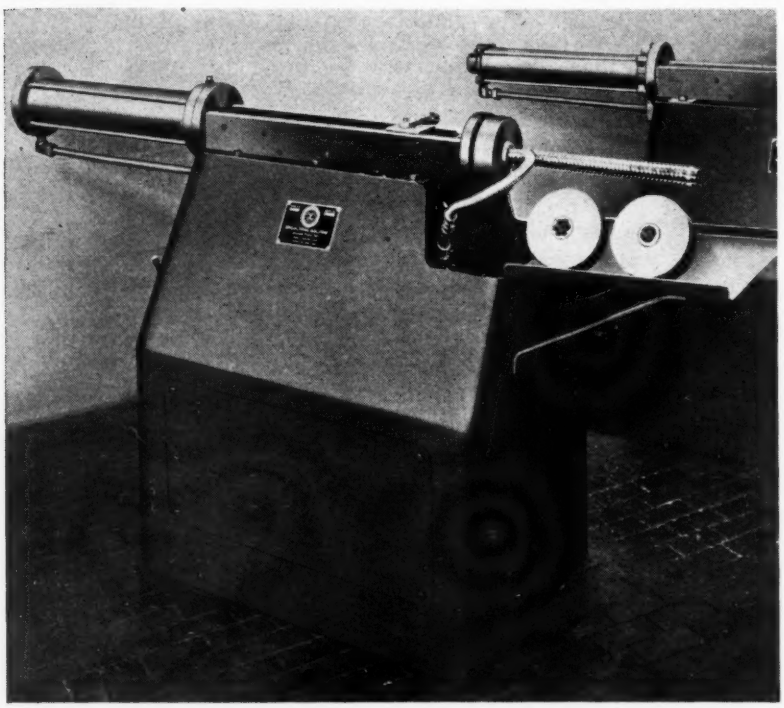
The Tri-Bits of high-speed steel, cast alloys, or of the carbide-tipped type, can be reground in individual holders and reset to size. The regular boring-bars are made with straight or tapered shanks. Special bars are also available for use in combination with other tools, such as facing or chamfering heads or hollow mills. 92



"Tri-Bit" Boring-bars Made by Weddell Tools, Inc.

Zagar Improved Horizontal Broaching Machine

An improved 20-inch hydraulic horizontal broaching machine, in which the upper right-hand corner of the cabinet is cut away to permit broaching larger bars and other work, has been brought out by Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio. The maximum size of piece that can be handled on this machine is limited only by the depth or distance from the center of the adapter down to the pan, which has been increased to 10 inches. The pulling capacity has also been doubled, or raised from 6000 to 12,000 pounds. The maximum cutting speed is now 20 feet per minute. 93



Zagar Improved Hydraulic Horizontal Broaching Machine

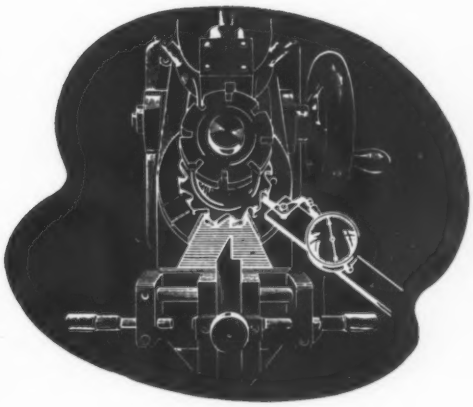
Honan-Crane Oil Clarifier

The Honan-Crane Corporation, 912 Sixth St., Lebanon, Ind., has developed an oil clarifier that is said to remove 95 to 98 per cent of all chips, abrasives, and other solid contamination from oils and coolants used in machine tool operations. This clarifier is designed to function continuously and to remove abrasives as fast as they are liberated, in order to assure a constant flow of clean oil or coolant to the machine tools at virtually no additional operating cost. Its cycle of operation is automatic, with the exception of the very brief occasional attention required for the removal of accumulated abrasives from the cotton tubing or the replacement of tubing when necessary.

This clarifier is built in two models; one type, the T-4, being designed to serve a single machine, is connected directly to the oil system and utilizes the oil pressure of the equipment pumps; the other, (T-8) is equipped with its own motor-driven pump, operates independently of the equipment system, being connected with the sump, and is capable of handling oil or coolants from two or more machines. 94

Oil Clarifier Placed on the Market by the Honan-Crane Corporation

To obtain additional information on equipment described on this page, see lower part of page 184.



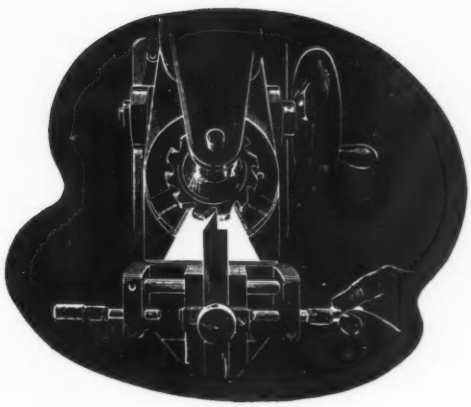


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Fig. 1. Jacobs "Rubber-Flex" Drill Chuck

Jacobs Rubber-Flex Drill Chucks

The heavy-duty drill chuck of radically new design shown in Fig. 1, in which a tough web of Neoprene synthetic rubber serves to keep the jaws in accurate alignment and permits one chuck to accommodate a wider range of drill sizes, has been developed by the Jacobs Mfg. Co., Hartford 2, Conn. In this chuck, the flexible spring steel collet shank of the conventional single-purpose type of drill chuck is replaced by Neoprene, which is bonded to the steel jaws as shown at *A*, Fig. 2. The Neoprene passes through anchoring holes in the eight jaws *B*, making the collet or inner socket of the chuck a compact conical-shaped unit. This "Rubber-Flex" collet member (as it is called) is tightened by a screw mechanism, which forces it forward into the smooth funnel-shaped nose of the chuck. As soon as the chuck is loosened for changing drills, the Neoprene web pushes the jaws apart and releases the drill shank.

All working faces of the hardened alloy-steel jaws are precision-ground after assembly in the Neoprene matrix, and maintain full-length contact with the drill shank when the chuck is closed or tightened. The toggle-like action of the jaw unit makes the collet self-tightening. The twelve models in which this chuck is now available are designed for multiple-spindle drilling machines, and cover a range of drill sizes from 1/16 to 9/16 inch. The smallest size will hold drills from 1/16 to 1/8 inch in diameter, and the largest size will hold drills from 15/32 to 9/16 inch in diameter. 95

Espen-Lucas Circular Saw Blade Grinder

A circular saw blade grinder of heavy rigid construction for sharpening inserted-tooth metal-cutting saws has been placed on the market by the Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia 23, Pa. This Model No. 27 machine is designed to grind teeth accurately and uniformly to within 0.001 inch and to maintain the correct tooth contour. Saws that have had their teeth properly ground on this machine can be operated at much faster cutting speeds and they will cut effectively for longer intervals between sharpenings. The grinder will regularly handle blades from 18 to 48 inches in diameter, and its capacity can be increased to 60 inches. A 3/4-H.P., 1800-R.P.M. motor is required to drive this machine. It occupies a floor space of 7 by 15 feet. 96

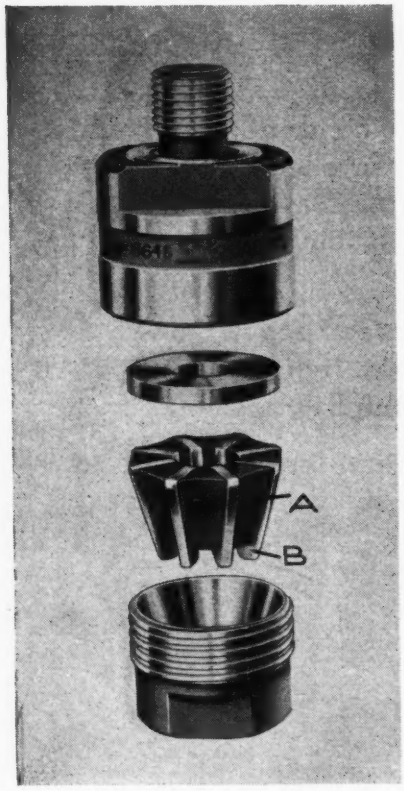
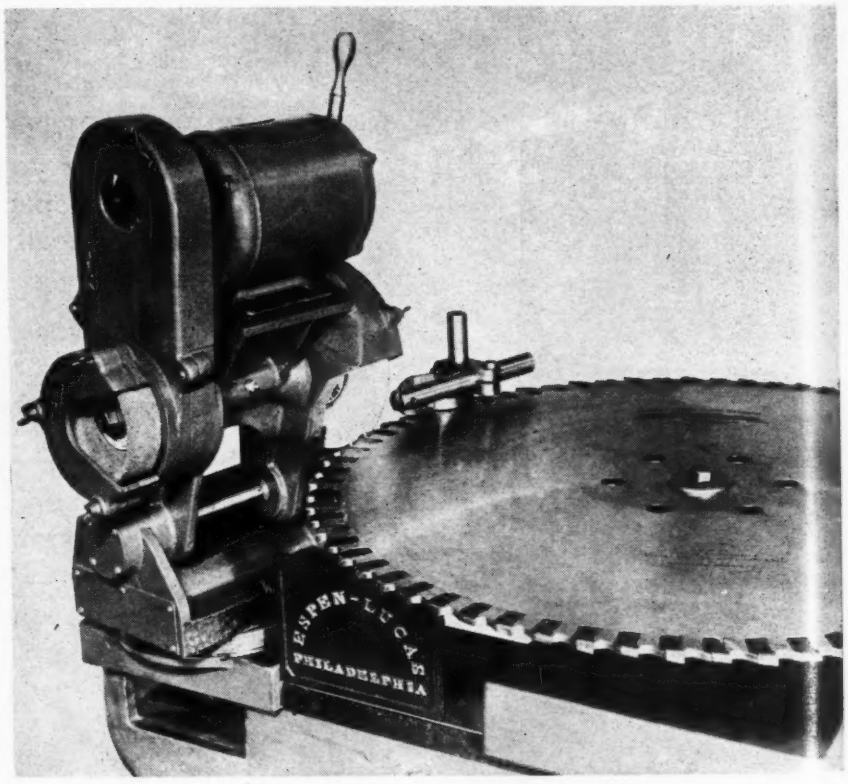


Fig. 2. Details of Jacobs Chuck Shown in Fig. 1



Circular Saw Blade Grinder Brought out by the Espen-Lucas Machine Works

To obtain additional information on equipment described on this page, see lower part of page 184.

The office manager, the artist, and the photographer!

(AND WHY THEY VISITED THE DRAFTING ROOM)

First time any of them had visited the drafting room!

But they'd heard that an Ozalid machine—recently installed to reproduce engineering drawings—could also reproduce—and simplify—much of their own work.

The Chief Draftsman obligingly listened to their accounts of varied problems and said:

"Ozalid can save you man-hours and dollars . . . as it does us."

He demonstrated how anything drawn, typed, printed, or photographed on translucent material could be reproduced in seconds—not minutes. AND be reproduced—not as a negative—but as any one of ten types of positive, Ozalid prints.

In different colors—black, blue, red, or sepia; on different base materials—paper, cloth, foil, or film.

He showed how these Ozalid prints could be used in many unique ways—for jobs beyond the scope of any other reproduction process.

THE ARTIST was intrigued by the manner in which advertising displays and folders could be made, and at the speed with which a layout could be altered and a new effect created.

Now, he said, he could do twice the work. (*He wondered if he could collect twice the pay.*)

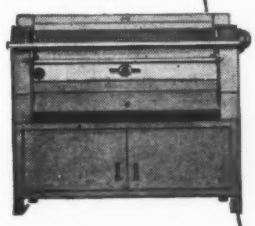
THE PHOTOGRAPHER was speechless when he saw Ozalid Dryphotos (continuous-tone photographic prints) produced in 18 seconds flat from a positive-film "master." Not one bath was necessary—just the same two steps employed to make all Ozalid prints—Exposure and Dry-Development.

THE OFFICE MANAGER, a man of great reserve, examined an Ozalid Rapid Black print of a typewritten report and said; "I'd swear this is the typed original . . . except that I can't smudge it."

OZALID

DIVISION OF GENERAL ANILINE & FILM CORPORATION
JOHNSON CITY, NEW YORK

Ozalid in Canada—Hughes-Owens Co., Ltd., Montreal



Suggestion:

If you have an Ozalid machine in your drafting room, stop by and ask for a demonstration. If you haven't adopted Ozalid as yet, *write for Simplified Printmaking.* It tells the whole story and contains samples of the 10 types of Ozalid prints you can make.

Thread Gages with Reversible Gaging Members Made by Size Control Co.

Reversible Thread Gages

The Size Control Co., Division of the American Machine & Gage Co., 4660 W. Fulton St., Chicago, Ill., has recently added to its line of reversible "Go" and "No Go" gages a twin line of reversible thread gages, for which patents have been applied. These new reversible gages are threaded along their entire length, and can be reversed in the handle when the gaging threads become worn. The leading edges when worn can be cut off. This operation can be repeated several times, thus considerably increasing the life of the gage. Polished green "Go" and red "No Go" gripping nuts are used at each end of the polished black handle for identification. 97

Titan Stud-Drivers

The No. 100 series automatic self-opening stud-driver shown in Fig. 1 has recently been placed on the market by the Titan Tool Co., Fairview, Erie County, Pa. This is said to be the only tool of its kind in which provision has been made for automatically compensating for wear on the gripping jaws. This stud-driver was designed for rugged use and to eliminate marking the stud threads. After the stud has been inserted in the holder and driven to its proper projection height, the cycle is reversed and all driving force is removed from the jaws before they are unlocked from the stud, ready to open to receive the next stud. This driver is made in four sizes to accommodate studs within the size range of from 3/16 to 1 inch.

Another new product brought out by the same company is the Type G reversible stud-driver shown in Fig. 2. This driver is designed for use either as a hand or power tool. It will drive studs where space is so limited that it would be impossible to use an automatic stud-driver because of its size. A slight reversing movement of the handles releases the stud and permits the stud-driver to be spun off.

All wearing parts are replaceable separately, and are made of high alloy heat-treated steel. When used as a power tool, the handles are removed, so that the driver can be adapted for use with whatever motive power is available. Adapters or shanks can be furnished to suit the driver. This driver is made in three sizes having capacities of 7/16, 9/16, and 3/4 inch. 98

Fig. 1. Titan Automatic Stud-driver

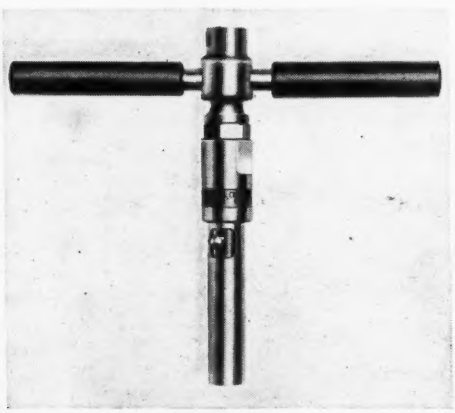
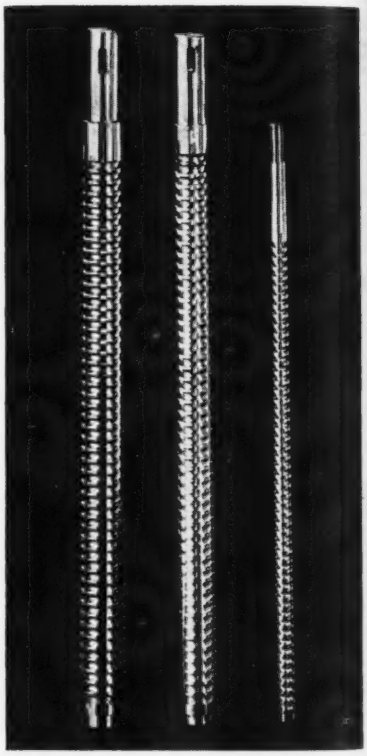


Fig. 2. Titan Stud-driver for Use as Hand or Power Tool

Zagar Broaches

Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio, is now making broaches especially designed for use in the Zagar 20-inch horizontal and 10-inch vertical hydraulic broaching machines. The typical broaches shown in the accompanying illustration include a six-spline broach, 1 1/2 inches in diameter at the widest point; a conventional broach with keyslot; and a threaded-end type for use with the Zagar quick-action broach-holder. These broaches are designed for finishing the largest hole that can be broached on the 20-inch horizontal machine. 99

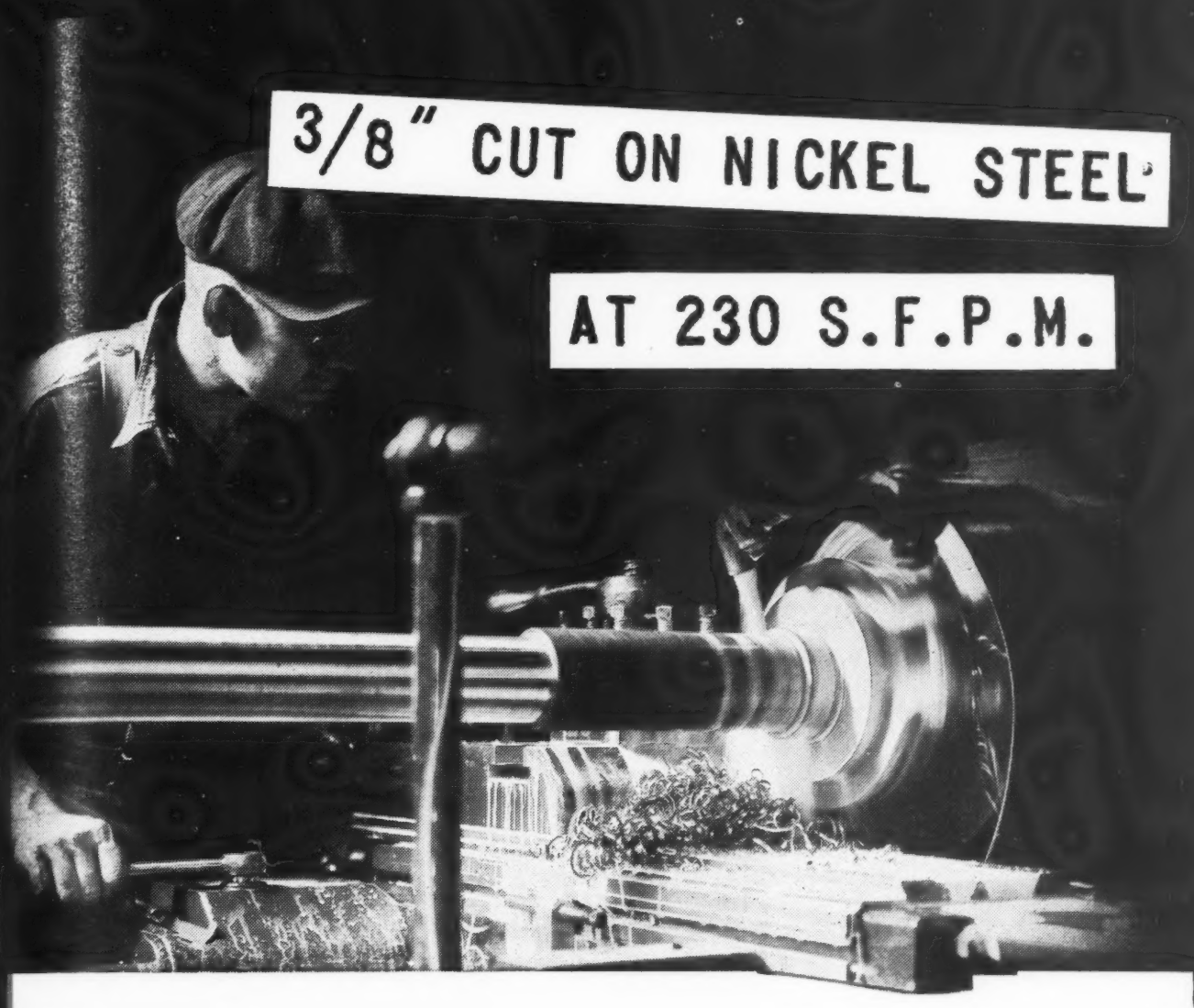


Zagar Broaches for Use in Vertical and Horizontal Machines

Webb Initial Pinch Type Bending Roll

A Model 6-L plate-bending roll has recently been placed on the market by the Webb Corporation,

To obtain additional information on equipment described on this page, see lower part of page 184.



SUNOCO EMULSIFYING CUTTING OIL...

Proves Its Worth Under Severe Operating-Conditions, Lengthens Life of Tools, Cuts Down Re-Grindings

When heavy cuts and heavy feeds are being taken on nickel steel . . . and peak production is to be achieved . . . it is essential to maintain accurate cutting-edges with long intervals between grinds.

Here is a case where a manufacturer's preference for Sunoco Emulsifying Cutting Oil is based on that type of performance.

Operation	Rough turning forged spindle
Machine	Monarch 20" Model "M" engine lathe
Material	S.A.E. 2350
Surface Cutting-Speed	230 feet per minute
Depth of Cut	⅜"
Feed per Revolution	.015"
Type of Tool	Tantalum Carbide
Cutting Lubricant	1 part Sunoco to 10 parts water

Sunoco has won the approval of leading machine-tool builders and metal-working plants for its outstanding work in a wide variety of tough metal-cutting operations like this on alloy steels, forgings, and other jobs where carbide tools are indicated.

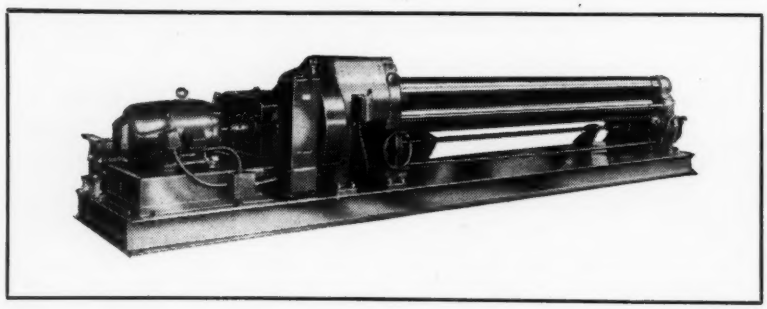
The outstanding lubricating, heat-absorbing, and rust-preventive qualities of Sunoco make possible longer runs between regrinds, greater accuracy, better finish, fewer rejects, and worthwhile savings in production-time. Let a test, run on Sunoco in your own plant, under your own operating conditions, convince you.

SUN OIL COMPANY • ***Philadelphia 3, Pa.***

Sponsors of the Sunoco News-Voice of the Air—Lowell Thomas

SUNOCO **SUN INDUSTRIAL PRODUCTS**

OILS FOR AMERICAN INDUSTRY

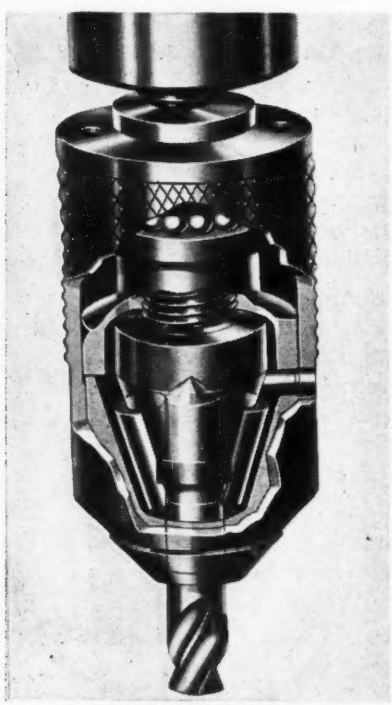


Initial Pinch Type Plate-bending Roll Made by Webb Corporation

Webb City, Mo. This new machine is of the initial pinch type, and is equipped with 9-inch diameter rolls throughout. It is built in five sizes, which cover a range for bending 4 feet of 5/8-inch mild steel plate up to 12 feet of 3/16-inch steel plate. 100

Turner Keyless Drill Chuck

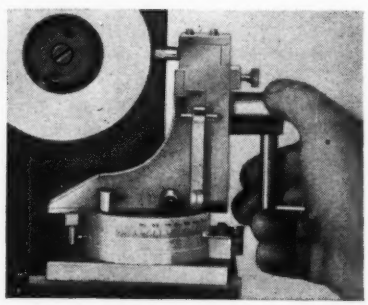
Turner Brothers, Inc., affiliated with the Turner Gauge Grinding Co., 2625 Hilton Road, Ferndale 20, Mich., are now manufacturing a new patented keyless chuck designed to hold drills securely without the usual tightening by hand with the conventional key. The chuck is self-centering, and holds the drill without scoring the shank or permitting it to slip. It is now available in sizes for holding drills 1/32 to 1/16, 1/16 to 1/8, 1/8 to 1/4, and 1/4 to 1/2 inch. 101



Turner Keyless Drill Chuck

J & S Radius- and Angle-Dresser

A new Model F radius- and angle-dresser designed to fill specific requirements in form-dressing grinding wheels has been added to the "Fluid-Motion" series of dressers made by the J & S Tool Co., 477 Main St., East Orange 12, N. J. This dresser embodies features of the larger Model E dresser previously brought out by this company.



J & S Radius- and Angle-dresser for Grinding Wheels up to 7 Inches in Diameter

It is well adapted for cylindrical grinders with spindle heights as low as 5 inches from the base of the table. Its compact size also makes it well suited for use with internal grinders having wheels under 7 inches in diameter. It is also adapted for use on small bench surface grinders.

Although only 5 3/8 inches high, with a diamond-point height of 5 inches and a base 3 3/16 by 4 inches, this dresser has a capacity for truing radii up to 1 1/2 inches on wheels up to 7 inches in diameter. 102

Machine Tool Builders Hold Annual Meeting

The National Machine Tool Builders' Association held its annual meeting at the Edgewater Beach Hotel, Chicago, Ill., Monday and Tuesday, October 22 and 23. An unusually large number of members attended to discuss the important current problems of the industry. A complete account of the meeting will be published in the December number of MACHINERY.

The following officers were elected for the coming year: President, W. P. Kirk, vice-president and sales manager of Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford, Conn.; first vice-president, H. H. Pease, president of the New Britain-Gridley Machine Division, New Britain Machine Co., New Britain, Conn.; second vice-president, A. G. Bryant, president of the Cleereman Machine Tool Co., Green Bay, Wis.; and treasurer, Richard E. LeBlond, president of the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio.

* * *

Simplified Practice for Band Saws

A proposed Simplified Practice Recommendation for hard-edge, flexible-back, metal-cutting band saws has been submitted to producers, distributors, and users for acceptance or comment by the Division of Simplified Practice, National Bureau of Standards. The proposed recommendation, which has been developed in cooperation with the industry, contemplates the establishment of a voluntary simplified list of regular type and skip-tooth type of hard-edge, flexible-back, metal-cutting band saws. Mimeographed copies of the proposed recommendation can be obtained from the Division of Simplified Practice, National Bureau of Standards, Washington 25, D. C.

* * *

The National Machine Tool Builders' Association, 10525 Carnegie Ave., Cleveland, Ohio, is distributing free a booklet entitled "Machines, Prices, Jobs," which tells how improved machinery contributes to high-level employment at good wages, and cites examples.

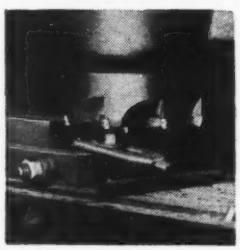
To obtain additional information on equipment described on this page, see lower part of page 184.

The New KENNAMILL "UNIVERSAL" FACE MILL

WITH WEDGED-IN, SOLID KENNAMETAL BLADES

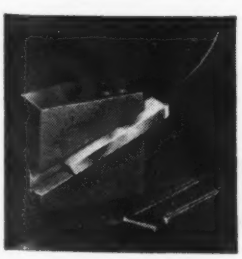
Reduces

- ✓ PRODUCTION COSTS
- ✓ TOOLING COSTS
- ✓ OFF-THE-JOB TIME
- ✓ GRINDING EXPENSE



ADAPTABLE FOR HIGH RATE MILLING ON ALL TYPES OF METAL

"Universal" Cutters for milling different materials vary only in the grade of Kennametal used in the blades, and the cutting angles. Kennametal blades are wedged into the body at fixed angles of 14° positive radial and 7° negative axial. Before being inserted, they are ground to provide a radial rake suitable for the material to be milled—7° negative for steel; 5° positive for cast-iron, brass, and bronze; 14° positive for aluminum and magnesium alloys. Only the blades are ground—the steel body is a permanent tool holder.



BLADES ARE RESHARPENED ON SURFACE GRINDER

Kennametal blades are reground uniformly to proper angles on a surface grinder, while being held in a simple jig. Illustration shows Kennametal blade in jig having top land ground, which, in conjunction with fixed blade angle in body, provides proper radial rake. Jig rests on another face for grinding clearance angle, and on a third face to grind face cutting edge angle. For finish cuts the face of the cutter is touched up on a cutter grinder. Reconditioning consumes much less time than is required for conventional cutters. Additional time is saved by having resharpened spares ready for quick replacement.

The Kennamill "Universal" Face Mill can be used for milling different materials, at high rates of metal removal, simply by interchanging blades having the right grade of Kennametal and proper cutting angles. Advanceable, solid Kennametal blades are wedged into the sturdy steel body at fixed angles, after having been ground on the edge to provide an effective cutting angle—negative radial rake for steel; positive radial rake for cast-iron and non-ferrous materials.

All design features of this cutter contribute to the possibility of removing a large volume of metal between regrinds. Radially set blades, rigidly supported, maintain their edge longer; and, because the blades are wedged-in instead of brazed-on, brazing strains are eliminated, either initially or during grinding. Hogging cuts, up to a depth of ⅛", are entirely feasible. Ample chip accommodation is provided for all depths of cuts.

The solid Kennametal blades can be reground on a surface grinder, as described at the left, thus eliminating need for special cutter grinders, and greatly reducing off-the-job-time required for reconditioning cutters having brazed-in tips. Blades can be resharpened many times, then used in smaller "Universal" Cutters.

The Kennamill "Universal" Face Mill is available in four sizes—4", 6", 8", and 10". Prices and particulars are yours for the asking.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

TRADE MARK REG U. S. PAT. OFF.

KENNAMETAL Inc., LATROBE, PA.

News of the Industry

California and Texas

IRVING HARRIS has withdrawn from the Marshall Tool & Supply Co., Los Angeles 21, Calif., because of ill health. The business will continue as in the past under the ownership of Carl and Mack Marshall.

E. L. STACEY, southern Texas representative for Federal Products Corportion, 1144 Eddy St., Providence 1, R. I., manufacturer of dial indicators and dial indicator gages, is now located at 718 Leeland Ave., Houston 2, Tex.

Illinois and Indiana

DOVER INDUSTRIES, INC., has started operations at its plant located at 2929 N. Campbell Ave., Chicago 18, Ill. This new enterprise was organized to manufacture metal articles requiring plated finishes, and to do jobbing work in that connection. L. D. JENSEN, formerly a vice-president of the Chromium Corporation of America, is president.

WARREN J. KILBURN has been made general manager of the American Gear & Mfg. Co., 6633 W. 65th St., Chicago, Ill. Mr. Kilburn has been sales manager of the firm since 1931. N. C. SCHLEGEL has been appointed sales manager of the organization. He has been Chicago branch manager of the Boston Gear Works, Inc., since 1936.

INTERNATIONAL DETROLA CORPORATION, Detroit 9, Mich., announces that it has sold its Indianapolis, Ind., machine tool plant and equipment. Production and servicing of Libby turret lathes have been transferred to the company's Elkhart, Ind., plant. The Indianapolis plant was purchased by the F. L. JACOBS Co. of Detroit, Mich.

R. E. WALSH has been appointed assistant manager of roll department, Continental Foundry & Machine Co., Pittsburgh, Pa. He will make his headquarters at the Chicago works of the company, which are located in East Chicago, Ind.

Michigan

A. HAROLD FRAUENTHAL has been advanced to the newly created position of chairman of the board of directors of the Kaydon Engineering Corporation, Muskegon, Mich. His previous position of president and general manager is now filled by FRANK J. DONOVAN. J. F. OEHLHOFFEN, formerly assistant to the president, will occupy the newly created position of vice-president in charge of sales. Mr. Frauenthal organized the corporation in 1941.

A. Harold Frauenthal, Newly Elected Chairman of the Board, the Kaydon Engineering Corpn.

ROBERT W. BURNHAM has been appointed factory manager of the Kaydon Engineering Corporation, Muskegon, Mich., manufacturer of ball and roller bearings. He was previously factory manager of the Ransom & Randolph Co., Toledo, Ohio. MAURICE JENSEN has been appointed general superintendent of the company. He was for twelve years previously superintendent of the grinding department of the Bantam Bearings Division of the Torrington Co., South Bend, Ind.

Robert W. Burnham, Recently Appointed Factory Manager of the Kaydon Engineering Corpn.

PROGRESSIVE WELDER CO., 3050 E. Outer Drive, Detroit 12, Mich., has enlarged its engineering staff by the appointment of P. D. DELEO as development engineer; I. A. CRAWFORD, research engineer; and E. Y. BUNTING, machine design engineer. Mr. DELEO and Mr. Bunting were formerly connected with the Federal Machine & Welder Co., and Mr. Crawford was previously associated with the Westinghouse Electric Corporation, specializing in resistance welding equipment design and applications. Mr. Crawford's new duties will include the management of the production welding department.

ACROMATIC TOOL CO., 640 E. State Fair, Detroit 3, Mich., manufacturer of tungsten-carbide and high-speed steel reamers, milling cutters, form tools, drills, and other special metal-cutting tools, announces the appointment of the following sales representatives: C. B. COLE, 24 S. Pulaski Road, Chicago 24 in the Chicago and Wisconsin territories; ERNEST W. NELSON, 201 Hoover Drive, Syracuse, N. Y., in the Syracuse, Rochester, and Buffalo areas; and J. W. BILLETT, 3664 Agnes Ave., Lynwood, Calif., in the southern California district.

RICHARD H. KHUEN ASSOCIATES, Grosse Pointe Bank Bldg., 279 Rivard Blvd., Grosse Pointe 30, Mich., is a new concern of consulting engineers specializing in powder metallurgy, with especial reference to the design of post-war products. The founder of the concern, Mr. Khuen, was formerly sales manager of the Chrysler Corporation's Powdered Metal Division.

M. L. BRICKER has been placed in charge of both productive and nonproductive manufacturing for the Ford Motor Co., Dearborn, Mich., and will be assisted by R. R. RAUSCH. R. H. MCCARROLL has been placed in charge of engineering; J. R. DAVIS in charge of sales and advertising; and C. H. CARROLL in charge of purchasing.

JOHN C. SMITH, formerly manager of manufacturing at the Canton, Ohio, Naval Ordnance Plant operated by the Westinghouse Electric Corporation, has been appointed works manager of the Naval Ordnance Plant at Center

MACHINING DATA ON PLASTICS

5. FILING, SANDING & GRINDING

This is the fifth in the series of messages designed to better your knowledge about the machining of molded phenolics — the most versatile of all plastics... the type of plastics which Durez has specialized in producing during the past quarter century.

In most instances, a Durez molded part comes from the mold with a high, smooth, lustrous surface which does not require additional finishing except for the flash line—or the parting line in split cavity molds. When the flash line is at the edge of the molded part, such as on bottle caps, a tumbling process is used. When the parting line is away from the edge and complete removal is desired, it is necessary to file, sand or grind the fins.

Filing

In hand or lathe filing, it has been found that bastard cut mill files are the most satisfactory for the removal of fins as well as for the life of the files. In practically all cases of machine filing, the file is held in the operator's hand permitting the use of most of the file surface at will and allowing the operator to give the file a certain twist or slide which is essential to correct filing. Recommended peripheral speed for machine filing is from 450 to 600 feet per minute.

Sanding

Most sanding operations are accomplished on disc wheels, endless flexible belts, and abrasive grinding wheels. This abrasive almost always consists of silicon carbide grains bonded with synthetic resin. Generally, for coarse sanding, Grade 90 is recommended. For fine sanding, especially when the surface must be reproduced by buffing, Grade 180 is recommended. However, in many cases it is necessary to use grades as fine as 240. Practically all sanding of phenolic materials is accomplished by the dry method. Recommended peripheral speeds for endless belts are 2500 feet per min., and for disc wheels up to 5000 feet per min.

Grinding

Grinding of phenolic molded parts is very rare. However, there are times when grinding is necessary especially on parts that might require an electrical contact by rotation or other means. In that case, the molded material and the metal insert are ground together. For example, National Grinding Wheel Co. recommends the following wheels and speeds for the various operations:

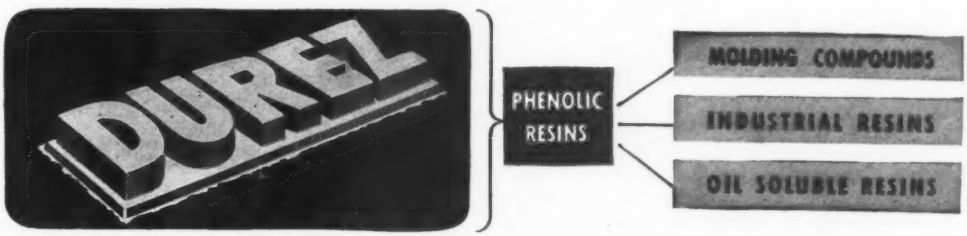
	Peripheral speed
Centerless grinding, rough operation C-36-K-10VM . . .	5500 ft. per min.
Finishing C-60-J-10VM. . . .	5500 ft. per min.
Cylindrical grinding, rough C-36-K-10VM . . .	5500 ft. per min.
Finishing C-60-J-10VM . . .	5500 ft. per min.
Disc surface grinding C-36-I-10BB	5500 ft. per min.
Face surface grinding C-46-H-10VE. . . .	4500 ft. per min.

All of the above are silicon carbide vitrified wheels. Most satisfactory results are obtained by wet grinding.

Cut-off operations, dry method	Peripheral speed
C-362-M-10BB. . .	9500 ft. per min.
wet 80-472	9500 ft. per min.

Both of the above cut-off wheels are silicon carbide rubber-bound.

The benefits of the vast experience which Durez technicians have acquired during the past quarter century are available at all times toward furthering your progress in the machining of phenolic plastics. Durez Plastics & Chemicals, Inc., 5811 Walck Road, North Tonawanda, N. Y.



PLASTICS THAT FIT THE JOB

Line, Mich. WILLIAM G. MILLER succeeds Mr. Smith as manager of manufacturing at the Ohio works.

BURNELL O. BURRITT has joined the engineering staff of the Craftsman Tool & Die Co., 3044 E. Outer Drive, Detroit 12, Mich., in the capacity of hydraulic design engineer. He was previously hydraulic development engineer with the Federal Machine & Welder Co., Warren, Ohio.

STURDY TOOL & GAGE CO., 14520 Shaefer Road, Detroit 27, Mich., is a new concern engaged in making tungsten-carbide precision gages. AL ROBINSON, founder of the company, was for sixteen years president of the Lincoln Park Tool & Gage Co., Lincoln Park, Mich.

CLYDE R. PATON has been named consulting engineer for the Ford Motor Co., Dearborn, Mich. He was recently director of automotive engineering at the Packard Motor Car Co.

New England

EXTRUDED PLASTICS, INC., Norwalk, Conn., announces the organization of a British firm known as DE LA RUE EXTRUSIONS LTD., which is the result of an association between EXTRUDED PLASTICS, INC., and THOMAS DE LA RUE & CO., LTD. of Great Britain, with branches and agencies throughout the world, exclusive of the United States and Canada. The new company will manufacture under license Tulox tubings and Interlox functional shapes, and will distribute these products in western Europe, the Middle East, and the British Empire, exclusive of the western hemisphere. The Plastics Division of DUPLATE CANADA LTD., Oshawa, Ontario, Canada, will manufacture the same products under license in Canada and Newfoundland. Extruded Plastics, Inc., also announces the completion of an extension to its factory.

WALTER F. SKILLIN has been elected president of the Union Mfg. Co., New Britain, Conn., to fill the vacancy caused by the death of Carl S. Neumann. Mr. Skillin was formerly vice-president in charge of engineering of Great American Industries, Meriden, Conn. He has also been elected a member of the board of directors of the Union Mfg. Co. NELS B. LAGERLOF has been elected assistant treasurer and assistant secretary of the company.

OLIN INDUSTRIES, INC., New Haven, Conn., announces the formation of a new export division to handle the expanded foreign business of all the manufacturing divisions and subsidiaries of the corporation. OLIVER E. NELSON, former export manager of the Winchester Repeating Arms Co. Division, has been appointed general manager of the new organization, with headquarters in New Haven.

RIPLEY CO., Torrington, Conn., announces the acquisition of all Goodyear rights to the low-voltage riveting iron for setting the du Pont explosive rivets. The Ripley Co. has also completed arrangements with E. I. du Pont de Nemours & Co., Inc., to produce the du Pont No. 6 riveting iron. It will be sold by du Pont for production applications.

CARLE W. BLADE has been appointed carbide representative for the Firth-Sterling Steel Co., McKeesport, Pa., in the southern and western Connecticut territory. Mr. Blade, who has been associated with the sale and use of sintered carbides for sixteeen years, will have his headquarters in Hartford, Conn.

CHARLES G. BELLEROSE has been appointed field representative in the Connecticut area for the Allen Mfg. Co., Hartford, Conn., maker of hex-socket screws and dowel-pins, and RALPH D. CASE, JR., has been made field representative for all of New York State.

BRIGHT LIGHT REFLECTOR CO. announces the removal of its Brooklyn, N. Y., factory to a recently acquired plant in Bridgeport, Conn.

RUSSELL G. CURTIS has joined the United Cinephone Corporation, Torrington, Conn., as works manager.

CHARLES H. PEIRCE has been made sales manager of the Edward Blake Co., 634 Commonwealth Ave., Newton Centre 59, Mass. He has had many years of industrial sales experience, and joins the Blake organization after being connected for nine years with the Taylor Instrument Companies.

GRANITE STATE ENGINEERING CO., mechanical and industrial engineers, announce the removal of their offices to new quarters at 124 Joilette St., Manchester, N. H.

Frank C. Tippery, Newly Appointed Works Manager of Morse Chain Co.

New York and New Jersey

RICHARD F. MOORE, of the Moore Special Tool Co., Inc., Bridgeport, Conn., was re-elected president of the National Tool and Die Manufacturers Association at a recent meeting in Buffalo. Other officers elected for the coming year are WILLIS G. EHRHARDT, Ehrhardt Tool & Machine Co., St. Louis, Mo., first vice-president; LEONARD E. MINGUS, William P. Stein & Co., Inc., Rochester, N. Y., second vice-president; JACK KLEINODER, John Volkert Tool & Die Co., New York City, secretary; and H. F. JAHN, The B. Jahn Mfg. Co., New Britain, Conn., treasurer. Headquarters of the Association are at 2 W. 45th St., New York City.

FRED M. READ, general manager of the Amtea Corporation, Empire State Bldg., New York City, left on October 1 for an extensive Latin-American trip, during which he will visit Mexico, Central America, the West Indies, and practically every country in South America with the view of making dealer appointments. The appointed dealers will send men to the United States for basic training in the application and use of the products of members of the Amtea Corporation. Mr. Read expects to be gone until June or July of next year.

DR. WENDELL F. HESS, professor of metallurgical engineering and head of the welding laboratory at Rensselaer Polytechnic Institute, Troy, N. Y., has been elected president of the American Welding Society for the coming year. HAROLD O. HILL, assistant chief engineer, fabricated steel construction, Bethlehem Steel Co., Bethlehem, Pa., has been elected first vice-president of the Society.

FRANK C. TIPPERY has been appointed works manager of the Ithaca, N. Y., plant of the Morse Chain Co. Mr. Tippery was previously connected with the Ford Motor Co., where he acted in many capacities, especially in connection with production problems and in the supervision of tools, dies, gages, and production equipment.

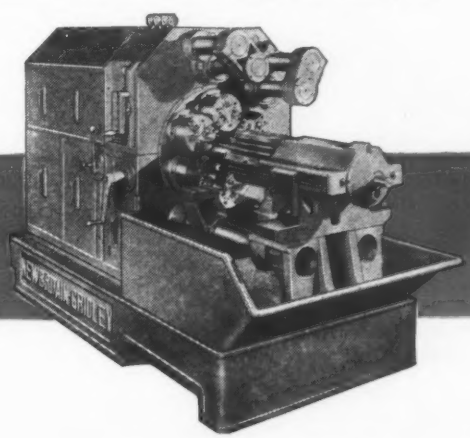
THOMAS H. NORSEN has been appointed representative in the Buffalo-Pittsburgh area of the Taft-Peirce Mfg. Co., Woonsocket, R. I., promoting

LAST STOP TOKYO!

The road from the Solomons to Tokyo has proved a long, tough, and costly battle . . . forty-four months of war in the Pacific, fighting a powerful, determined and treacherous enemy. Since November 1942, strategy and the coordinated efforts of land, sea and air power have effectively smashed Jap resistance.

The success of the Pacific War can be attributed to the fearlessness of our fighting men supplied with the best of equipment and the most destructive fire power the world has ever known. Much of this power and equipment was made possible by machining millions of vital parts on New Britain bar and chucking machines . . . speedily and accurately.

Now New Britains will again be called upon to excel in the production of finer things in a brighter world to come. Take advantage of New Britain achievements in solving your manufacturing problems automatically. Consult with our Sales-Engineer near you, or should you prefer, communicate direct.



NEW BRITAIN AUTOMATICS

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
NEW BRITAIN-GRIDLEY MACHINE DIVISION

M-01021

the company's contract manufacturing service, as well as its lines of small tools, gages, and surface grinders. He will be stationed in Buffalo, and will cover upper New York State and western Pennsylvania.

J. J. SMITH has been appointed manager of the Schenectady plant of the American Locomotive Co., following the promotion of W. L. LENTZ from this position to vice-president in charge of manufacturing of the company. DAVID T. COLEMAN and WALTER C. ROCKENSTIRE have been named assistant managers, in charge of personnel and manufacturing, respectively.

ALFRED H. EMERY has been appointed chief engineer of the Standard Gage Co., Inc., Poughkeepsie, N. Y. He has been connected with the company for twenty years. NOEL DE CORDOVA has been made sales manager of the company. WILLIAM R. DONALDSON was recently elected a member of the board of directors.

THE LINDE AIR PRODUCTS COMPANY, UNIT OF UNION CARBIDE AND CARBON CORPORATION, 30 E. 42nd St., New York City, announces that plans have been made for the construction of oxygen and acetylene distributing facilities in Mobile, Ala., and Miami, Fla.

ROBERT B. MCCOLL has been elected executive vice-president of the American Locomotive Co., 30 Church St., New York 8, N. Y. Mr. McColl is succeeded as vice-president in charge of manufacturing by W. L. LENTZ of the Schenectady works.

LEWIS J. MALE, assistant general superintendent of the Schenectady Works of the General Electric Co., has been appointed general superintendent, succeeding BERNHARD G. TANG, who has retired after completing more than forty-five years of service with the company.

Lewis J. Male, New General Superintendent of Schenectady Works, General Electric Co.

RAYMOND W. YOUNG, chief engineer since 1940, of the Wright Aeronautical Corporation, 30 Rockefeller Plaza, New York 20, N. Y., has been appointed vice-president in charge of engineering. He is succeeded as chief engineer by W. G. LUNDQUIST.

RICHARD D. ELWELL, authority on materials handling recently released from the Navy, has joined McKinsey & Co., 60 E. 42nd St., New York 17, N. Y., management consultants.

MISS G. D. KILE has been appointed advertising manager of the Vanadium Corporation of America, 420 Lexington Ave., New York 17, N. Y.

WALKER-TURNER CO., INC., Plainfield, N. J., manufacturer of metal-working and wood-working machine tools, has broken ground for additions to both of its plants. The total area of the new construction for the two plants will be 200,000 square feet. It is expected that the work will be completed before the end of the year.

Ohio

TOOLCRAFT PRODUCTS CO., 915 Webster St., Dayton, Ohio, has started the construction of a $35,000 two-story brick addition to the firm's plant, which is expected to be completed by the first of January. The company is engaged in building dies, jigs, fixtures, tools, and special machinery. When the construction is completed, the TOOLCRAFT ENGINEERING CO., now located at 126 S. Ludlow St., Dayton, will be moved to the new building, and will occupy the entire second floor.

LINCOLN ELECTRIC CO., Cleveland, Ohio, announces the appointment of the following district office representatives, who have been added to the firm's engineering staff in the capacity of welding engineers: JOHN A. SMITHERS, Detroit, Mich.; W. L. HERBST, Chattanooga, Tenn.; HAROLD H. HOUSE, Moline, Ill.; L. B. WALLNER, Duluth, Minn., replacing I. R. BARTTER, who has been promoted to the position of welding engineer at Grand Rapids, Mich.; and C. M. BURNETT, Boston, Mass.

LIEUTENANT-COLONEL JOHN S. TAWRESEY has been appointed vice-president in charge of engineering of the Bunting Brass & Bronze Co., Toledo, Ohio. He will direct research on modern bearing design and applications. Colonel Tawresey has been serving as executive assistant to the chief of the Resources Control Section of the United States Army Air Corps at the Wright Field, Dayton, Ohio.

John S. Tawresey, Vice-president in Charge of Engineering of the Bunting Brass & Bronze Co.

H. J. FITZPATRICK, formerly works manager of Plant 9 of the Crosley Corporation, Cincinnati, Ohio, has been made works manager of all the Crosley plants in Cincinnati. Mr. Fitzpatrick joined the Crosley organization in 1942. He formerly held executive positions with the Nash-Kelvinator Corporation, the Apex Co., and with several automobile concerns, including Dodge and Chrysler.

WILLIAM J. CHOVANEC, formerly a member of the engineering staff of the Cleveland Automatic Machine Co., Cleveland, Ohio, has been appointed district sales manager for the Cincinnati territory. Mr. Chovanec has been associated with the company for the last sixteen years, having started as an apprentice in the machine shop.

WILLIAM E. KLINGEMAN has joined the Precision Welder and Machine Co., of Cincinnati, Ohio, as chief engineer. Mr. Klingeman until recently was assistant sales manager of the Federal Machine and Welder Co., Warren, Ohio.

LIEUTENANT FRANKLIN P. CLARK, recently of the Navy Bureau of Supplies and Accounts, has been appointed sales manager of the Upson-Walton Co., Cleveland, Ohio, manufacturer of wire rope, fittings, etc.

ROBERT H. BOYER has been appointed sales engineer by the Osborn Mfg. Co., Cleveland, Ohio, manufacturer of industrial brushes.

HOWARD SPENCER recently joined the Salem Engineering Co., Salem, Ohio.

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Pennsylvania

J. H. EDMONDS, general manager of the Lebanon, Pa., plant of the Bethlehem Steel Co., has retired and is succeeded by WALTER R. PENMAN, formerly assistant general manager. Mr. Edmonds has been connected with the company since 1907, and has been general manager at Lebanon since 1928. Mr. Penman's entire industrial career has been with the Bethlehem Steel Co. He entered the employ of the company at Lebanon in 1919, and has been assistant general manager since 1940. ROBERT L. RILEY, assistant factory superintendent, succeeds Mr. Penman as assistant general manager.

WASHINGTON STEEL CORPORATION, Washington, Pa., has recently been organized to produce stainless steel in both sheet and strip form. T. S. FITCH, formerly manager of the Composite Steel Division of the Jessop Steel Co., Washington, Pa., is president of the new company, and F. G. GERARD, formerly plant superintendent of the Eastern Rolling Mi l Co., Baltimore, Md., is vice-president in charge of operations. During the war Mr. Fitch was a special assistant in the Steel Division of the War Production Board.

W. E. MULLESTEIN has been appointed manager of the Coatesville district sales office of the Lukens Steel Co. and its subsidiaries, the By-Products Steel Corporation and Lukenweld, Inc., Coatesville, Pa. Mr. Mullestein has just returned from Europe, where he held an important post with the U. S. Strategic Bombing Survey of the War Department. Previously he was acting assistant sales manager of Lukenwe d, Inc.

WILLIAM C. SIMPSON, who has been associated with the Lukens Steel Co., Coatesville, Pa., since 1934, has been named manager of sales of Lukenweld, Inc., a Lukens subsidiary. He was previously manager of direct sales for the Lukens Steel Co.

William C. Simpson, Newly Appointed Manager of Sales of Lukenweld, Inc.

ALLEGHENY LUDLUM STEEL CORPORATION, Pittsburgh, Pa., is planning to erect a highly modern $2,000,000 research laboratory and experimental center at its headquarters plant at Brackenridge, Pa. The new facilities will be used especially for research on stainless, magnetic, valve, tool, and other steels produced by the company. The laboratory will be completely air-conditioned, and will contain all types of equipment required for research work in the steel industry.

R. F. INGRAM, previously general sales manager of the Landis Tool Co., Waynesboro, Pa., has been appointed secretary and vice-president. W. P. LOTZ, who was eastern sales manager, will succeed Mr. Ingram as general sales manager.

PITTSBURGH STEEL FOUNDRY CORPORATION, Glassport, Pa., has purchased the plant and equipment of the FORT PITT STEEL CASTING Co., located at McKeesport, and will operate the plant as the FORT PITT DIVISION of the Pittsburgh Steel Foundry Corporation. T. F. DORSEY, for many years connected with the Fort Pitt company, has been appointed general manager of the division.

LIEUTENANT-COLONEL C. F. WILEY, who has been on leave of absence as secretary to Thomas Machine Mfg. Co., Pittsburgh, Pa., has returned to his former position, following retirement from the Army. Lieutenant-Colonel Wiley served in the U. S. Army Coast Artillery, recently being stationed at Fort Monroe, Va., as secretary of the Coast Artillery School.

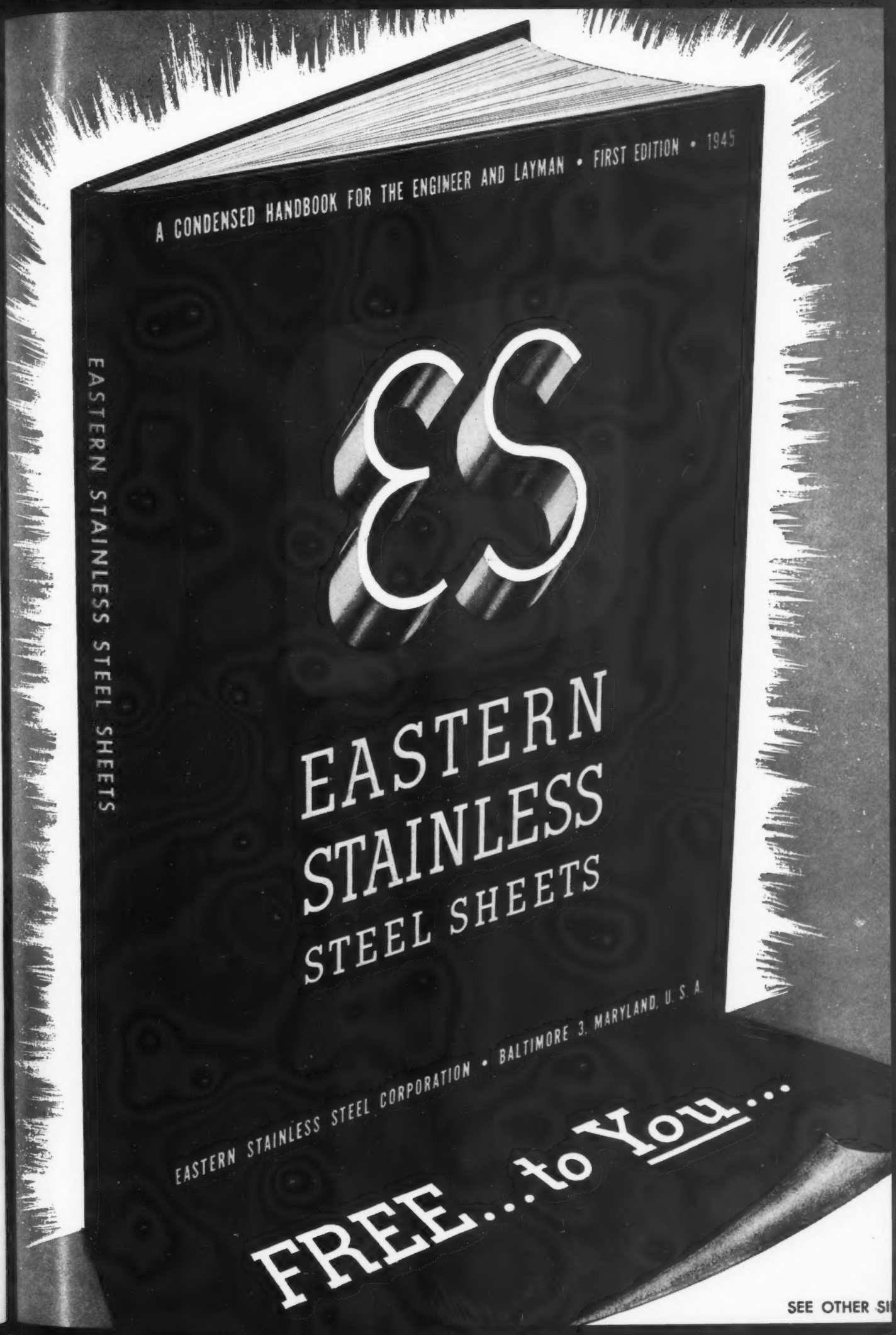
CHARLES E. LEHR, chief engineer of the Bethlehem, Pa., plant of the Bethlehem Steel Co., has retired after fifty-four years of service with the company and its predecessor, the Bethlehem Iron Co. His successor is JOHN A. TAYLOR, formerly superintendent of the Lower Manufac uring Shops.

CHARLES F. KELLS, formerly on the industrial engineering staff of West Penn Power Co., Pittsburgh, Pa., has taken over the management of the new post-war educational program of the Electric Industrial Truck Association. He will make his headquarters in Pittsburgh.

ARTHUR H. BROWN, who has been associated with the Lukens Steel Co. and subsidiaries, By-Products Steel Corporation and Lukenweld, Inc., Coatesville, Pa., since 1930, has been

R. F. Ingram, New Secretary and Vice-president of the Landis Tool Co.

W. P. Lotz, Who Succeeds Mr. Ingram as General Sales Manager, Landis Tool Co.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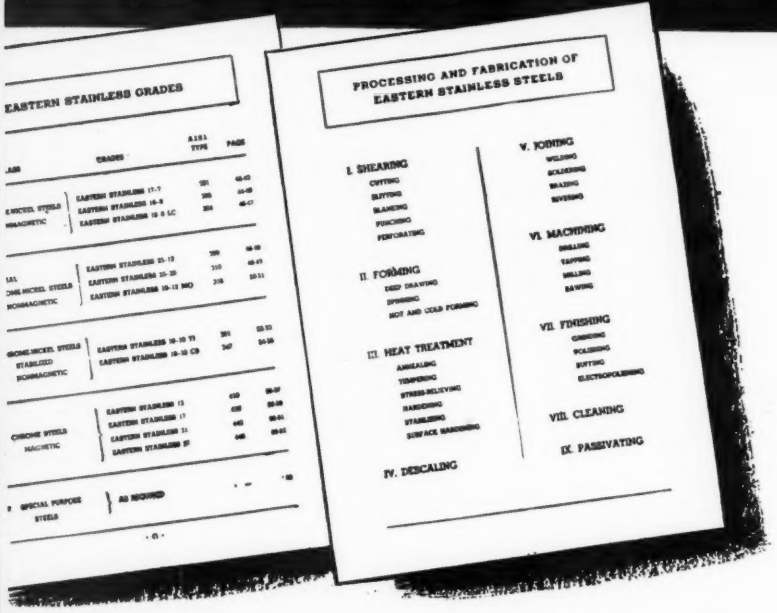

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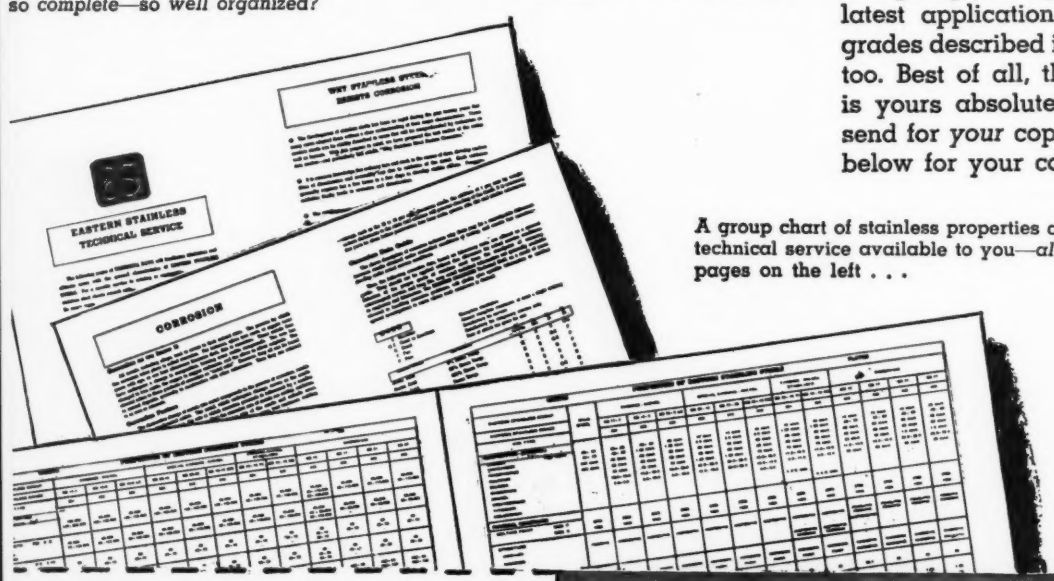

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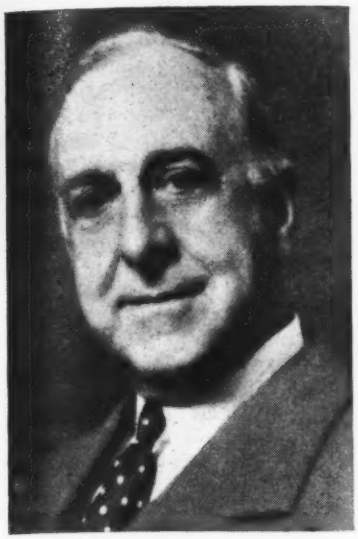
named manager of sales for Pittsburgh and vicinity. His headquarters will be at 429 Fourth Ave., Pittsburgh.



Floyd Rose, Newly Elected Chairman of Board of the Firth-Sterling Steel Co.

FLOYD ROSE, formerly president of the Vanadium-Alloys Steel Co., Latrobe, Pa., has been elected chairman of the board of the Firth-Sterling Steel Co., McKeesport, Pa. He had been with the Vanadium-Alloys Steel Co. since 1926.

DR. FRANCIS C. FRARY, director of research of the Aluminum Co. of America, Pittsburgh, Pa., has been elected to receive the Perkin Medal, awarded by the American Section of the Society of Chemical Industry, in recognition of his outstanding accomplishments in the field of industrial research. The presentation will take place at a dinner meeting of the Society at the Hotel Commodore on January 11, 1946.

R. D. WOOD CO., selling agent for the FLORENCE PIPE FOUNDRY & MACHINE CO., announces the removal of the company's office from 400 Chestnut St. to 1072 Public Ledger Bldg., Independence Square, Philadelphia 5, Pa.

EDWARD C. HOEFLICH has been appointed sales manager of the Ace Mfg. Corporation, Philadelphia, Pa. Mr. Hoeflich was formerly with Henry Disston & Sons.

FRANK E. WALLING, acting manager of the Lewis Foundry and Machine Division of Blaw-Knox Co., Pittsburgh, Pa., has been made president and general manager of the division.

ROBERT E. O'BRIEN has become a member of the sales organization of the Heppenstall Co., Pittsburgh, Pa.

Wisconsin

LYNN MATTHIAS, director of research of the Allen-Bradley Co., Milwaukee, Wis., has been selected, under the authority of the U. S. Army Intelligence Service, as a technical representative of the controller industry to visit motor control plants in Germany and to report to the industry on foreign controller developments and practices.

R. N. LANDRETH has been appointed assistant to the vice-president of the General Machinery Division of the Allis-Chalmers Mfg. Co., Milwaukee, Wis. Mr. Landreth, who has been special representative for the company, will continue to reside in Washington, D. C.

ARTHUR R. TOFTE has been named manager of the advertising and public relations department of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., succeeding GEORGE J. CALLOS, who is now connected with Klau-Van Pietersom-Dunlap Associates, of Milwaukee.

DONALD D. DILWORTH, formerly account executive with Kenyon and Eckhardt, New York advertising agency, has joined the staff of Klau-Van Pietersom-Dunlap Associates, Inc., Milwaukee, Wis.

GEORGE H. FOBIAN, formerly vice-president and director of the Oilgear Co., Milwaukee, Wis., has been elected president to succeed the late Harry Swigart.

N. F. ADAMSON has been elected vice-president in charge of sales and engineering of the Twin Disc Clutch Co., Racine, Wis. E. C. BILLINGS has been made sales manager of the Racine Division, and ROGER DELONG has been appointed sales manager of the Hydraulic Division at Rockford, Ill. G. W. BUELKE has been appointed chief engineer of the Racine Division.

N. F. Adamson, Vice-president in Charge of Sales and Engineering of Twin Disc Clutch Co.

The Hundredth Anniversary of the General Machinery Corporation

The two principal organizations forming the General Machinery Corporation, Hamilton, Ohio, are the Hooven, Owens, Rentschler Co. and the Niles Tool Works Co., the beginnings of both of which go back one hundred years. The former was founded by Job E. Owens in Hamilton in 1845, and the latter in the same year by the Niles brothers, James and Jonathan, in Cincinnati.

In 1845, Owens, who had just arrived in Hamilton, bid on the iron and steel portions for a new jail to be built in Hamilton. Early in 1846, he was awarded this contract. His organization soon became known as Owens, Ebert & Dyer — later Owens, Lane & Dyer. At first it manufactured nearly everything conceivable that could be made of metal—from waffle irons to paper-making machinery, stationary steam engines, road traction engines, horse- and steam-driven threshing machines, saw mills, etc. In 1882, the firm was reorganized and became the Hooven, Owens, Rentschler Co. In 1883 the first of a long line of Corliss steam engines rolled out of the doors of the plant. The present shop, with its very high bays, was completed in 1902.

The Niles Works, first located in Cincinnati, were engaged in repairing stern-wheel river boats. Later this plant built a wide variety of products, testified to by the fact that in 1857 the locomotive business was sold to one buyer, the sugar mill business to another, and the steam engine business to still a third manufacturer. Quite early in its existence the Niles Works built machine tools. In 1872, the manufacture of machine tools was moved to Hamilton, Ohio, and the name changed to Niles Tool Works. In 1892, the business was incorporated as the Niles Tool Works Co., and in 1899, it became a division of Niles-Bement-Pond Co. Finally, in 1928, the present George Adam Rentschler merged it with the Hooven, Owens, Rentschler Co., of which he was then president, and the two companies became known as the General Machinery Corporation.

Obituaries

W. Chichester Sayle

W. CHICHESTER SAYLE, president of the Cleveland Punch & Shear Works Co., Cleveland, Ohio, and of the Cleveland Crane & Engineering Co., Willoughby, Ohio, died suddenly at his home on September 15. He was the son of the late Walter D. Sayle. Upon the death of his father in 1941, he became president of both companies, which his father had founded sixty-five and fifty years ago, respectively.

EUGENE C. BATCHELAR, Pittsburgh manager of the Motch & Merryweather Machinery Co., Cleveland, Ohio, for more than thirty-six years, died on September 15 in the Allegheny General Hospital, Pittsburgh, Pa. after an eight months' illness. Mr. Batchelar, in addition to being manager of the Pittsburgh district office, was a director of the company. He received his training in engineering at Cornell University, from which he was graduated in 1902 in the Department of Mechanical Engineering. He was a member of the Engineering Society of Western Pennsylvania, the American Society of Tool Engineers the Cornell Club, the Railway Club, the Rotary Club, and the University Club, of which he was vice-president and director. He was also chairman of the Machine Tool Panel in Pittsburgh.

CARL SAMUEL NEUMANN, president of the Union Mfg. Co., New Britain, Conn., died on September 13. Mr. Neumann had been connected with the company for forty-two years. He had served as president for the last sixteen years, and was a director of the company for thirty-eight years.

New Books and Publications

MACHINE TOOL GUIDE. By Tom C. Plumridge, Roy W. Boyd, Jr., and James McKinney, Jr. 780 pages, 8½ by 11 inches. Published by the American Technical Society, Drexel Ave. at 58th St., Chicago 37, Ill. Price, $7.50.

This book contains a collection of drawings, dimensions, specifications, and all important data on the principal machine tools, including automatics, boring machines, broaching machines, contour machines, drilling machines, duplicators, gear cutters, grinders, hobbing machines, lathes, milling machines, planers, presses, shapers, slotters, and tapping machines. Sixty-one of the important manufacturers of these machines have cooperated in the preparation of the material. The book is bound in a loose-leaf binder so that up-to-date material can be added as required. It is prepared especially with the aim of furnishing essential information to tool engineers, millwrights, and tool equipment salesmen.

TRAINING FOR SUPERVISION IN INDUSTRY. By George H. Fern. 188 pages, 6 by 9 inches. Published by the McGraw-Hill Book Co., Inc., New York 18, N. Y. Price, $2.

This book contains information intended to give direct help to the supervisor with the problems of his daily job, especially in the fields of human relations and training. It deals specifically with such problems as maintaining mental health in industry, handling problems of women workers, promoting safety, training new workers, and disciplinary problems. Throughout the book emphasis is laid on the importance of the conference method of studying job problems and analyzing them by group discussion.

Coming Events

NOVEMBER 5—Monthly meeting of the Greater New York Chapter of the AMERICAN SOCIETY OF TOOL ENGINEERS, at 8 P. M. in the North Ball Room of the Hotel New Yorker in New York City.

NOVEMBER 6-7—National Fuels and Lubricants meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Mayo Hotel, Tulsa, Okla. Secretary and general manager, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

NOVEMBER 16-17—Forty-sixth annual convention of the NATIONAL METAL TRADES ASSOCIATION at the Hotel Cleveland, Cleveland, Ohio. Secretary, Charles L. Blatchford, 122 S. Michigan Ave., Chicago 3, Ill.

NOVEMBER 19-20—Annual meeting of the AMERICAN MACHINE TOOL DISTRIBUTORS' ASSOCIATION at the Hotel Statler, Cleveland, Ohio. Thomas A. Fernley, Jr., 505 Arch St., Philadelphia, Pa., executive secretary.

NOVEMBER 26-30—Annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in New York City. C. E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

DECEMBER 3-5—National Air Transport Engineering meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Edgewater Beach Hotel, Chicago, Ill. Secretary and general manager, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

JANUARY 7-11, 1946—Annual meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS and Engineering Display at the Book-Cadillac Hotel, Detroit, Mich. Secretary and general manager, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

FEBRUARY 4-7, 1946—National meeting of the AMERICAN WELDING SOCIETY in Cleveland, Ohio; headquarters, Hotel Cleveland. Secretary, Miss M. M. Kelly, 33 W. 39th St., New York City.

FEBRUARY 4-8, 1946—METAL CONGRESS AND TWENTY-SEVENTH NATIONAL METAL EXPOSITION at the Public Auditorium, Cleveland, Ohio. Also annual convention of the AMERICAN SOCIETY FOR METALS in Cleveland; headquarters, Hotel Statler. National secretary, 7301 Euclid Ave., Cleveland 3, Ohio.

FEBRUARY 4-8, 1946—National meeting of the IRON and STEEL and INSTITUTE of METALS DIVISIONS of the AMERICAN INSTITUTE of MINING and METALLURGICAL ENGINEERS in Cleveland, Ohio; headquarters, Statler Hotel. Assistant secretary, Frank Sisco, 29 W. 39th St. New York 18, N. Y.

APRIL 3-5, 1946 — National Aeronautical meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Hotel New Yorker, New York City. Secretary and general manager, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

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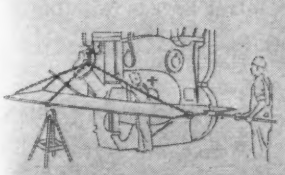

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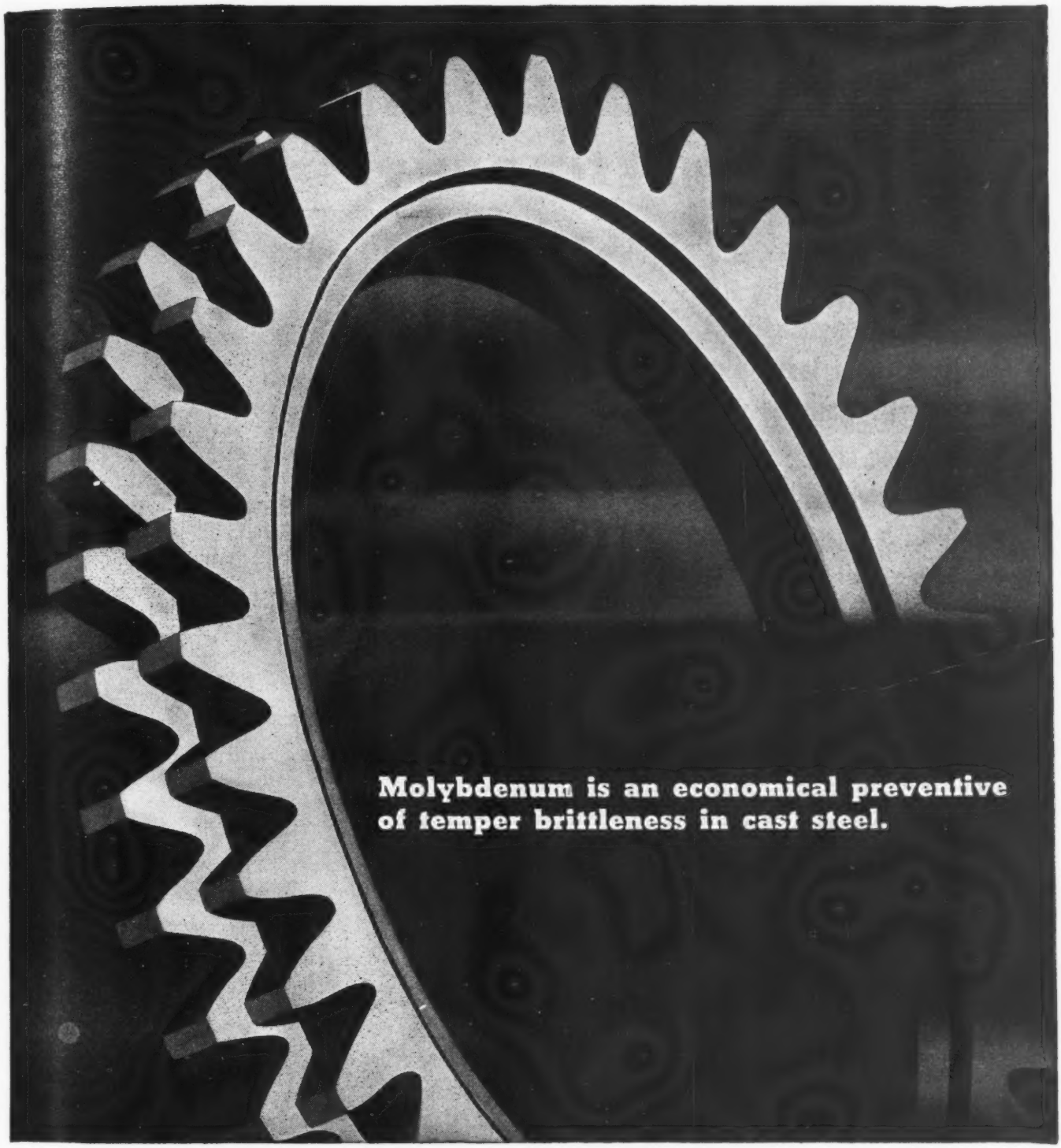

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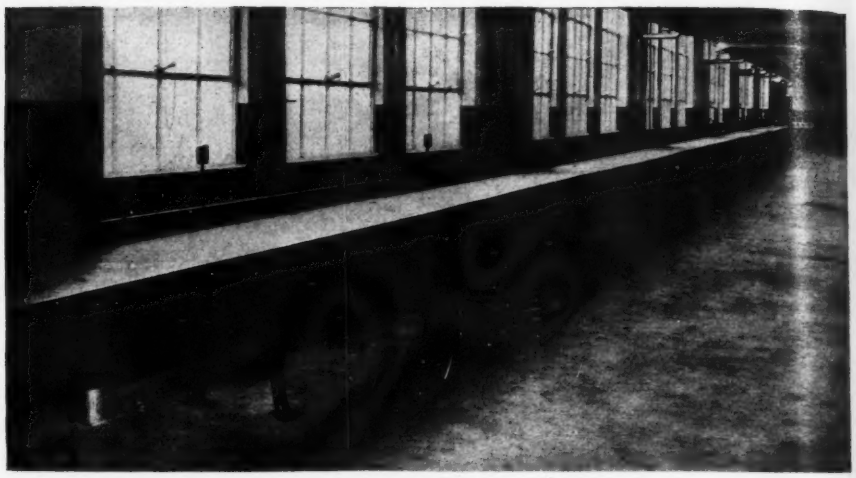

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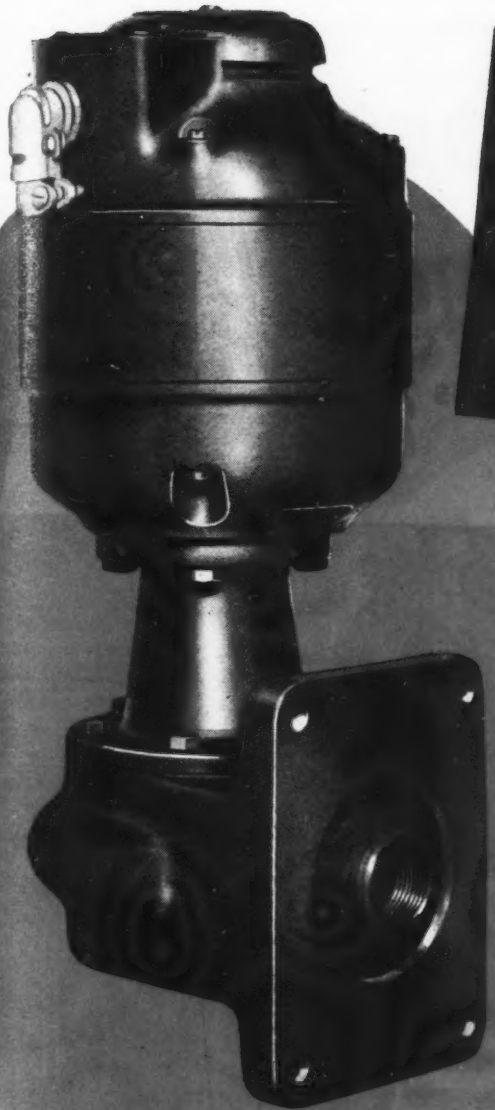

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Choose GUSHERS

Today, the leading manufacturers of virtually every type of machine tool (the list sounds like an industrial Who's Who!) specify the Gusher Coolant Pump as standard equipment. They know that, Ruthman-equipped, their machines give the most efficient performance on post-war production . . . . assure customer satisfaction . . . . help maintain the good will that means continued leadership in their field.

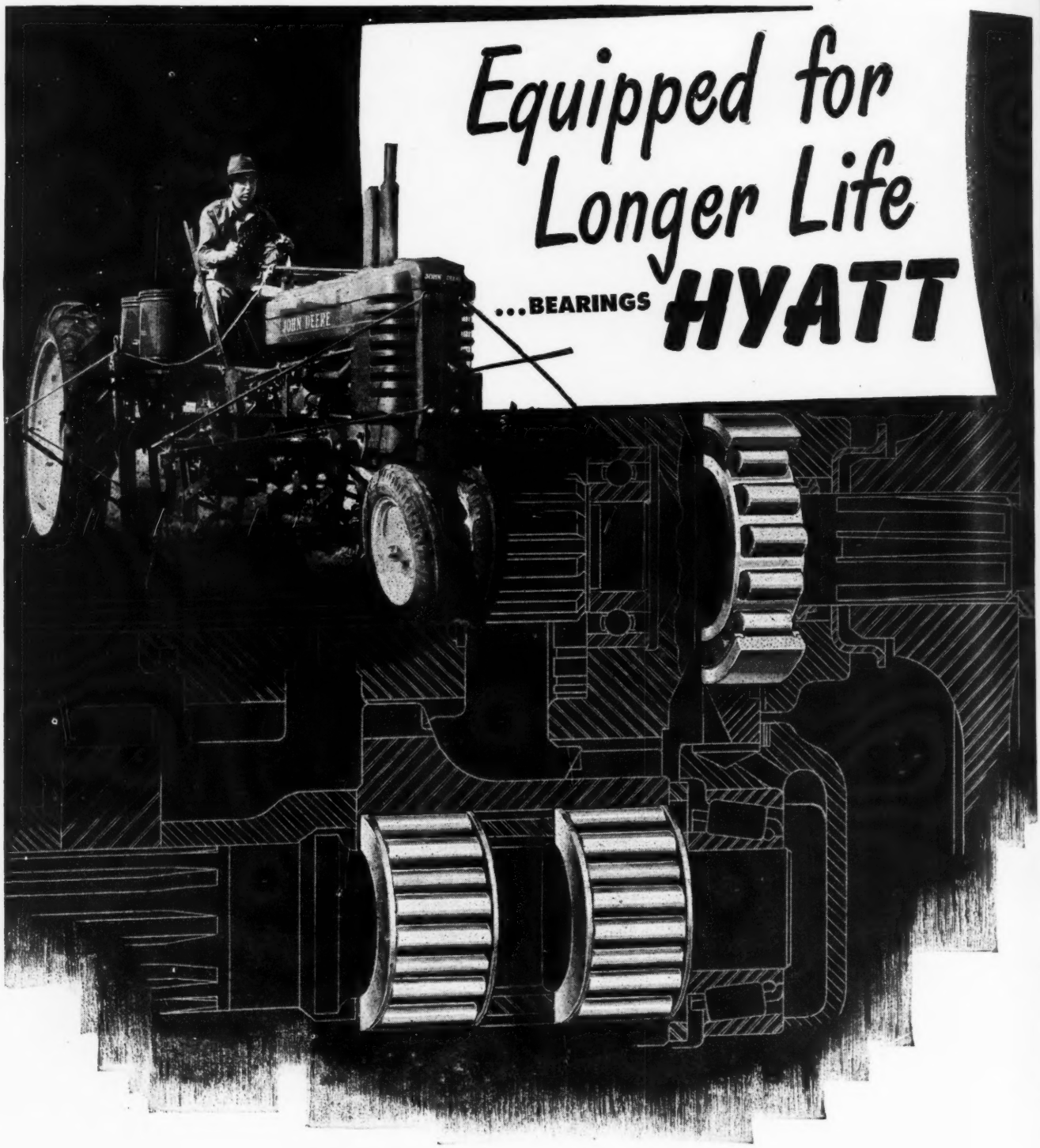
Check these advantageous features of Gusher construction and operation: Automatic priming (a real time-saver) gives split-second delivery of coolant in just the volume desired. Throttling decreases power consumed. Simple design eliminates all packing nuts, relief valves—making for minimum maintenance. Chip- and grit-laden coolants can't harm pump, nor can lapping and grinding compounds, since there are no metal-to-metal contacts. Full ball bearing design minimizes friction. Compact design, easy installation. If you manufacture machine tools, or want to equip your present machines with improved coolant pumps for modern production needs—write for our complete catalog with blueprint diagrams, data, prices.

Four of the many types of Gusher Coolant Pump are shown here. Remember — there's a Gusher to meet most requirements as to type of intake, discharge, location on machine and pumping capacities. Special pumps built to your specifications—send blueprint of machine plus data on volume, pressure required, type of coolant used, preferred method of installation.

THE COOLANT *Heart* FOR A GOOD MACHINE

GUSHER COOLANT PUMPS

THE RUTHMAN MACHINERY CO., 1800-1823 Reading Rd., Cincinnati. O.



FOR MORE THAN HALF A CENTURY the vital working parts of most farm machines have been equipped with Hyatt Roller Bearings.

During this time there have been vast changes in designs of tractors, threshers, combines, pickers and other farm equipment but the specifications "Bearings-Hyatt" have remained standard.

Hyatt Hy-Load type of bearing on the main shaft and Hyatt Solid Roller Assemblies on the spool gear, as shown in the Deere Tractor transmission above, are typical. Proof of performance, lower cost of operating and longer life for equipment are unbeatable reasons why farmers prefer machines equipped with Hyatt Roller Bearings.

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION

Harrison, New Jersey • Chicago • Detroit • Pittsburgh • Oakland, California

in Condor V-BELTS
put your horsepower in Victory's harness

—through flexibility, lasting service and extreme lack of stretch.

Stout, tough strands of pre-stretched cords, in the Whipcord Neutral-Axis Section, carry the load smoothly from motor to machine. These Whipcords — the load-carrying sinews in Condor V-Belts — fortify the FLEXLASTICS* in which they are embedded and through which they dissipate the heat from internal friction and high-speed flexing.

Outwardly these basic qualities are not visible to the eye, but they confirm their value to you in months—often years—of added service, which is translated into more efficient power transmission, greater production, added profit and a better position when full-scale competition returns to enforce production cost control.

Condor V-Belts are only one of the many MANHATTAN industrial rubber products in which FLEXLASTICS,* with engineered and correctly placed Strength Members, deliver added service. The Condor Whipcord Strength Member is a MANHATTAN development.

Get ready now for the day when restrictions are dropped and write for the new Condor V-Belt Bulletin No. 6868B.**

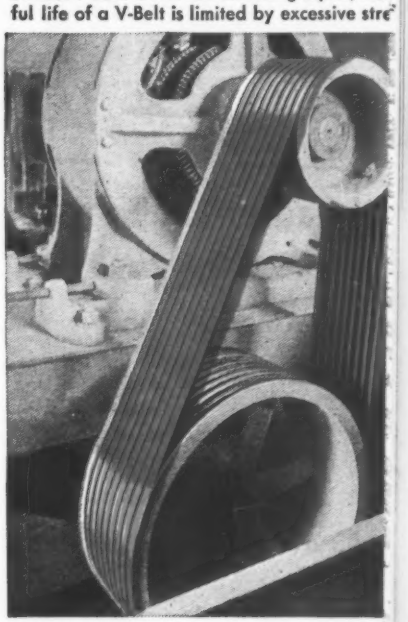
** The term FLEXLASTICS is an exclusive MANHATTAN trade mark. Only MANHATTAN can make FLEXLASTICS.*

*** Condor V-Belts are now made in the dark, war-time color.*

8 POINTS OF BALANCE

1. Wide margin of strength
2. Minimum inelastic stretch
3. Uniform flexibility
4. Maximum resistance to structural breakdown
5. Smooth running
6. Maximum trac
7. High resistance side wear
8. Correct lateral reinforcement

These 8 Points correctly embodied in ev Condor V-Belt. Other factors being equal, the ful life of a V-Belt is limited by excessive stre

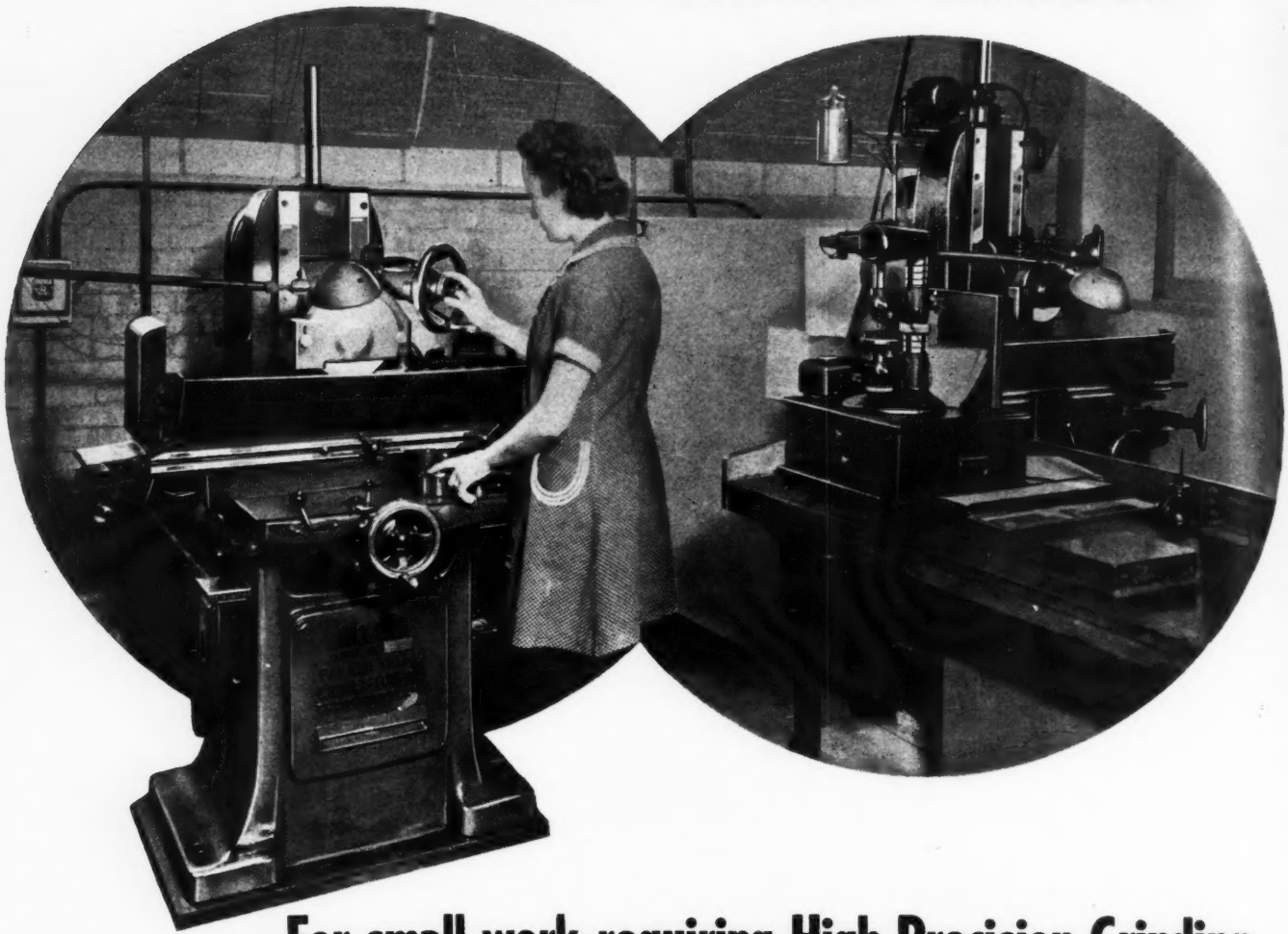


Condor V-Belts are used in every field industry to step up production and to step d costs. They are Victory's harness for horsepo

RM

THE MANHATTAN RUBBER MANUFACTURING DIVISIO
OF RAYBESTOS-MANHATTAN, INC.
EXECUTIVE OFFICES AND FACTORIES PASSAIC, NEW JERSE

Grinding to "GAGE BLOCK" accuracy on a GRAND RAPIDS GRINDER!



For small work requiring High Precision Grinding—the Grand Rapids No. 25 has earned wide popularity

The Webber Gage Company of Cleveland uses a battery of Grand Rapids Grinders (like the No. 25 Precision Type shown in their plant, above) for the high precision finish grinding of gage blocks and parts for comparators. These Grand Rapids features assure perfect finishing at maximum production rates:

- One-piece column and base casting.
- Patented vertical movement of wheel head, quick adjustment within limits of .0001".
- Hydraulic table feed, infinitely varied speeds for best finish.
- Convenient, positive controls.
- Bijur one-shot lubrication, practically eliminates oiling time.
- Two usable spindle speeds.
- Portable motor-driven coolant system.

The No. 25 Grinder has table working surface of 6" x 18". Maximum longitudinal table speed 80 fpm. Automatic table travel—longitudinal 20", transverse 6½". Other models with larger dimensions and capacities. For full details on complete line of Grand Rapids Precision Type Surface Grinders—

Write for Bulletin GL-100!

GRINDING PROBLEM ON YOUR MIND?

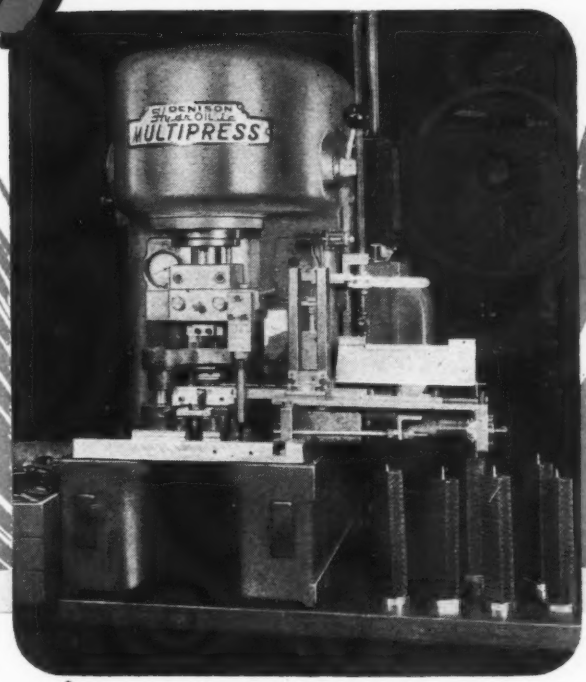
Whatever its nature, feel free to consult us. We may not know "all the answers" (who does?)—but in over 35 years' specialization in the business of grinding we've experienced enough to be able to show many inquirers the way to better, faster, more efficient grinding. No obligation, just—

write today to:

GALLMEYER & LIVINGSTON CO.

305 STRAIGHT AVE., S. W., GRAND RAPIDS 4, MICH.

MULTIPRESS SHAVES Production Costs for GILLETTE



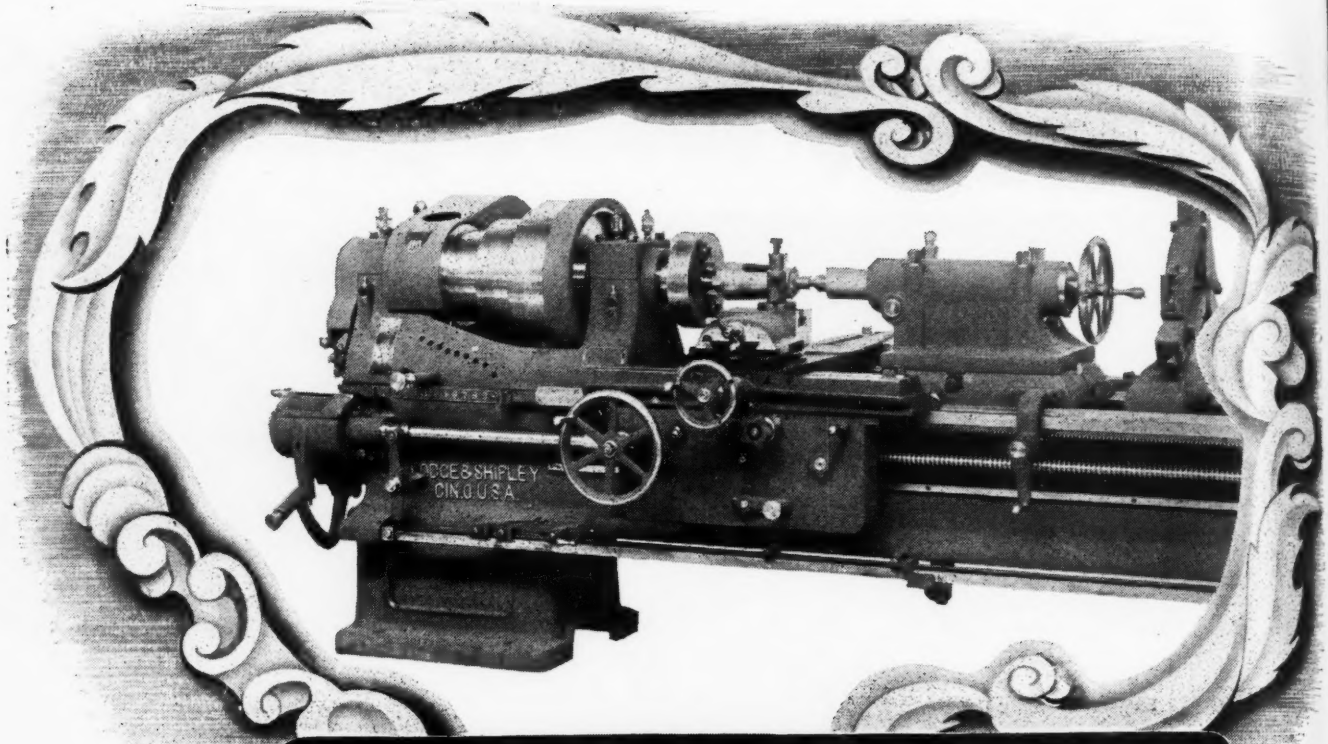
Higher Output on Precision Punching Operation

MULTIPRESS proves its advantages on another task . . . punching key slots in metal safety razor guards at the Gillette plant in South Boston. Performance records show reduced "downtime" for maintenance and tooling "setups"... thus, *higher* daily production. Reduction of noise is another important factor. And this completely self-contained, fully automatic, HydrOILic press occupies less space than previously used equipment. In this case, the user designed his own automatic feed device for the versatile MULTIPRESS . . . made easier by the unit's clean lines and smooth surfaces.

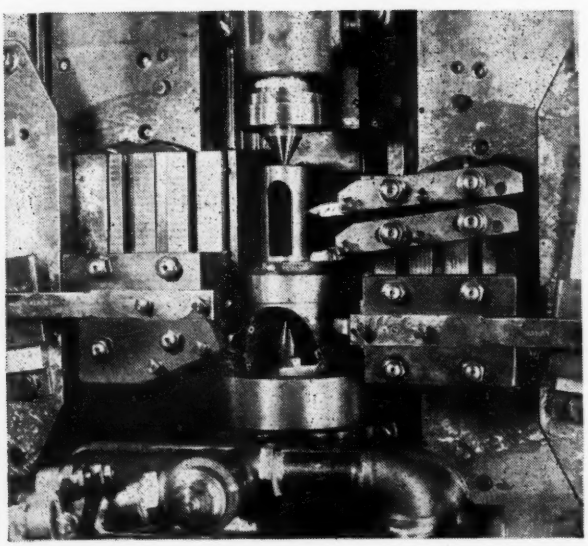
Built in 4, 6, and 8-ton capacities, MULTIPRESS is bringing similar production gains and efficiency to scores of production jobs. Standard accessories, such as, straightening fixtures, extension tables, bolster plates, indexing tables and others are available for these manually controlled or automatic cycling units... plus the amazing new Vibratory Ram Action, which provides automatically-delivered, short ram strokes at frequencies up to 500 per minute, with each of those strokes exerting closely regulative, uniform pressure on the work! Even the number of those vibratory strokes per ram cycle may be controlled automatically. Write for details!

The DENISON Engineering Co.
1152 Dublin Rd., Columbus 16, Ohio

DENISON
EQUIPMENT *in* APPLIED
*Hydr*OIL*ics*



HOW WELL CAN A 1917 LATHE *Do Today's Valve Jobs?*



L & S Engineers will gladly give you a practical demonstration of Duomatic superiority on your own work. There is no obligation. Write for detailed literature No. 601 and No. 620 on 2A and 3A Duomatics.

●Imagine the old-fashioned lathe above being used on a tough chrome nickel alloy steel valve. Limited to a few feeds and a single tool, separate settings were required for straight and taper turning. In those days it took a skilled operator considerable time to turn a valve job.

Obviously, this lathe would be completely inadequate for a shop requiring high output, precision work, and low costs. Yet lathes even a few years old may be almost as obsolete—when placed alongside the new 2A or 3A Duomatic, Lodge and Shipley *full automatic* lathes.

Consider the valve plug at the left done on a 3A Duomatic. Multiple tools perform all straight turning operations at one time, front and rear, and taper turning front and rear—simultaneously. The set-up for two tapers is easily converted to set-ups for tapers of different sizes. An unskilled operator can turn out precision valve parts quickly and economically.

Dual tool slides—front and rear—operate singly or together . . . can be used for a wide range of cycles in turning and in straight and angular facing operations. A Duomatic is like two lathes in one. It may actually equal *several* of your old or pre-war models in total output, plus quality and accuracy never before obtainable.

LODGE & SHIPLEY

MACHINE TOOL CO.

L & S LATHES

CINCINNATI 25, OHIO, U. S. A.

MACHINE TOOL DIVISION 3055 COLERAIN AVE. • SPECIAL PRODUCTS DIVISION 800 EVANS ST.

RECONVERT with NORTON

GRINDING WHEELS WHERE YOU NEED THEM!

FACTORY STOCK

Thousands of square feet of stock rooms at the Worcester factory containing over 18,000 different abrasive items.

WAREHOUSE STOCKS

Well-stocked warehouses in five industrial centers—Chicago, Detroit, Cleveland, Pittsburgh and Philadelphia.

DISTRIBUTOR STOCKS

Over 200 distributors in 184 cities with stocks selected to meet local needs.

And in Types and Sizes for Every Grinding Job

RECONVERSION may bring you new grinding problems, but you can be sure of finding the right wheels to solve them in the Norton line—and stocked handy to you.

There are wheels in several varieties of Alundum abrasive (including the new record-breaking 57 Alundum) for grinding steels and steel alloys; wheels of Crystolon abrasive for cast iron, brass, and the light metals; and Norton diamond wheels for the carbides, glass, porcelain, and other unusual jobs. Bonds include B-E vitrified, resinoid, rubber, shellac, and silicate. And of course there's the patented Norton Controlled Structure process of manufacture.

Reconverting with Norton assures you the right wheel for each new grinding job and the engineering "know-how" to select them for you.

NORTON COMPANY, Worcester 6, Mass.

Behr-Manning, Troy, N. Y. is a Norton Division

NORTON ABRASIVES

SO...NOW WE'RE BACK WHERE ARITHMETIC REALLY COUNTS...

This is pre-war stuff.

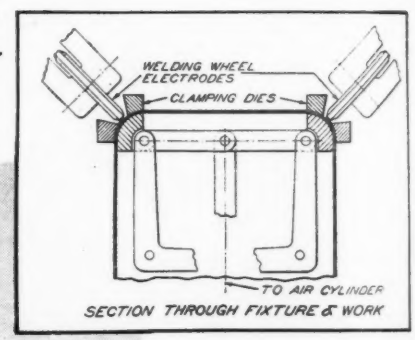
We cite it because it bears directly on the kind of goods you will make from now on, for Joe Civilian . . . remember him?

Production cost savings which must be made to maintain that better-than-pre-war standard of living necessary to your expanded facilities CAN be made in metal working industries by the application of Federal Resistance Welding.

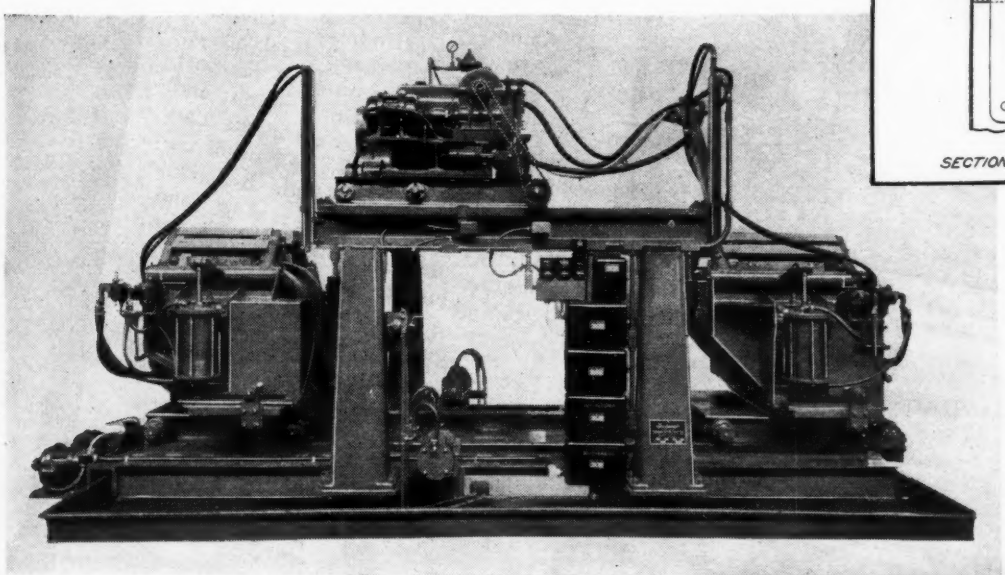
The cost arithmetic shown is from the records of one of the country's leading manufacturers. Three Federal Seam Welders of the type shown on the next page were installed in their plant. Their use resulted in annual savings of $18,000 in costs. A report of 2½ years operation showed the welders had paid for themselves and returned $24,000 profit.

Except for the fact that it is comparatively a modest example, this is typical of direct savings achieved when a product and Federal Resistance Welding are brought together by careful engineering and design. Such records are not limited to any one type of metal working industry. Successful applications cover everything from small parts assembly or joining stainless steel blades to mild steel handles for tools or cutlery, clear through all branches of sheet metal fabrications (including refrigerator liners, casings, grilles and parts) to heavy flash welding of steel ring gear blanks ten or more feet in diameter, with solid cross-sections of eighteen inches.

To find out how Federal Resistance Welding can affect the arithmetic of your particular production problem, send your specifications for applications analysis



SECTION THROUGH FIXTURE & WORK



THIS FEDERAL RESISTANCE SEAM WELDER

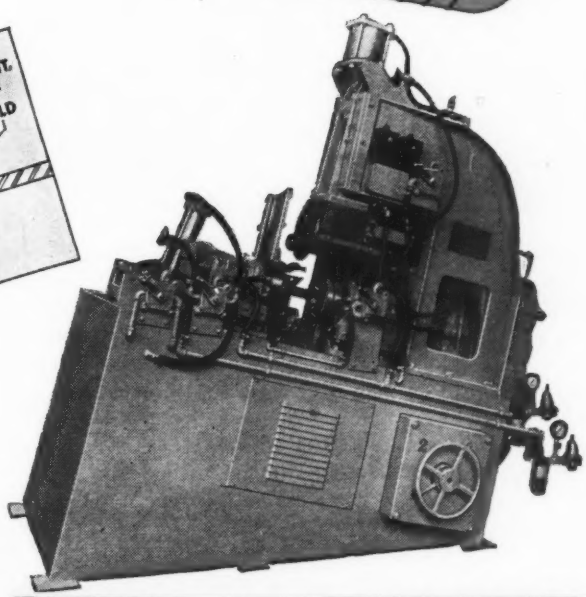
Seam welds multiple, leak-tight joints like this.

INSTALLED BECAUSE IT CUTS COSTS

The Federal

MACHINE AND WELDER CO

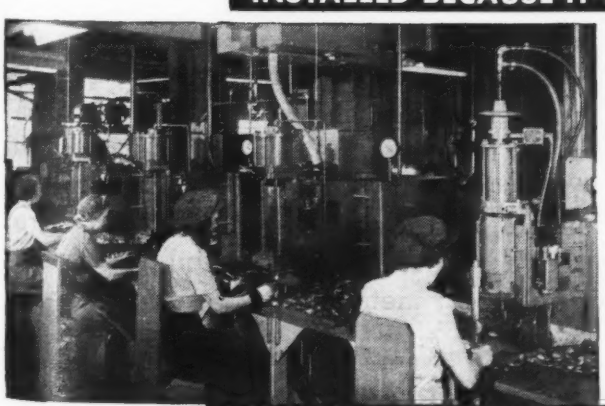
THIS KIND OF



THIS FEDERAL RESISTANCE SEAM WELDER

Seam welds refrigerator casings like this.

INSTALLED BECAUSE IT CUTS COSTS



THESE FEDERAL RESISTANCE WELDERS

All standard models, attain high production in assembling small parts components.

INSTALLED BECAUSE THEY CUT COSTS

MEMBER RESISTANCE WELDER MANUFACTURERS' ASSOCIATION RWMA

208 DANA ST., WARREN, O.

VERSATILE MODERN PRODUCTION TOOLS

NEW HYDRAULIC WELDERS

Two new models of spot and projection welders, hydraulically operated, are described for the first time in detail in Bulletin 4520 issued by The Federal Machine and Welder Company. One type, available in three sizes with 30, 50, or 75 KVA transformers, employs an inverted hydraulic cylinder in which the piston rod is the fixed member mounted on a unique adjustable connection which provides for close timing and quick follow up. A larger model, available in two sizes of 100 and 150 KVA also is described. Complete specifications are listed.

HOUSEWARE PRODUCTION

Anticipated expansion of houseware production points up the advantages of Federal resistance welding for the fast, low cost application of handles to enameling steel or aluminum pots and pans. Press type welders are used, with dies that permit rapid loading, give production of 500 to 800 handles per hour, depending upon type of handle applied. Cost with one manufacturer is one-fifth previous method.

HOW TO MAKE PROJECTIONS

Interesting and useful information on machines and methods for projection resistance welding is included in a new sixteen page booklet just released by The Federal Machine and Welder Company. There are descriptions of various types of projections, tables of proper measurements for projections and complete data on twenty varieties of welders adaptable for either projection of spot welding.

Several interesting special applications are illustrated. These include an eight-station dial-feed fixture for automatic welding of radar tube assemblies at high speed; a dual head for series projection welding; a special fixture for welding aircraft heat exchangers; several air clamping fixtures for quick loading and unloading of work in welding dies; a machine that automatically welds nails to trim moulding.

Special equipment such as rubber heads, air-lock heads and anti-friction slides also are shown. The book is available on request . . . Bulletin 4520.

FOR CONTAINER MAKERS

A special book of particular interest to container manufacturers is in the list of literature available on request at The Federal Machine and Welder Company. Principal theme is description of a complete steel barrel welding plant. Several special machines for resistance welding a variety of metal containers are illustrated. Bulletin SP 245.

A New Force...in Sheet Metal Production

View in Plant of ACF-Brill Motors Company

The alloy sheets from which these stampings are made have great strength and resilience. The impact of the CECOSTAMP forms and gives the stamping a permanent set.

In the foreground is shown a plaster-of-paris pattern from which the Kirksite die shown in the CECOSTAMP was cast. Dies are inexpensive, quickly made, and salvageable.

Typical of the work being produced on the CECOSTAMP are the stampings shown in the photograph above, taken in the sheet metal shop of one of the country's largest builders of rail car and bus bodies. The parts shown, and the dies from which they are made are an indication of the possibilities of this newest form of sheet metal production equipment.

The CECOSTAMP is a high-production, impact-type stamp designed to form metal parts from sheets of high strength and great resilience. It was designed by Chambersburg engineers to solve the immediate and urgent sheet metal production problems of the aircraft industry and is in use in practically every aircraft factory.

Write for catalog and data

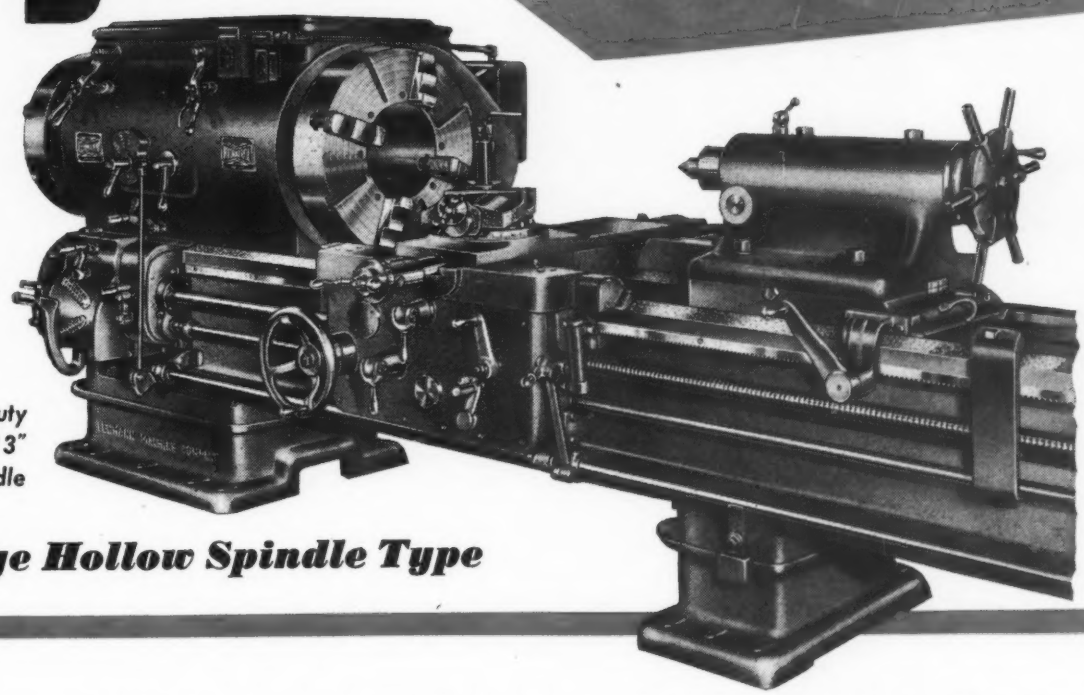
CHAMBERSBURG ENGINEERING CO.

CHAMBERSBURG **PENNSYLVANIA**

CECOSTAMP

Do Important Machining Jobs in 1/2 to 1/7 the Time!

on a Hydratrol Lathe



30" Heavy Duty Lathe with 13" Hole in Spindle

Large Hollow Spindle Type

Yes, in a number of big plants important operations are being performed in 1/2 to 1/7th the time of previous operations. In one plant, Large Hollow Spindle Type of HYDRATROL LATHES are saving 15,000 man hours per month! Why not let us show you what a HYDRATROL LATHE could do in your plant?

5 SIZES—18" to 36"

Small	18" up to 7¼" Hole	Large	30" up to 14" Hole
Medium . .	24" up to 12" Hole	Large	36" up to 16½" Hole
Large	27" up to 13" Hole	*(Standard Type lathes, 16" to 36")*	

7 Distinctive Features:

- ★ Easy, Fast, Simple Operation.
- ★ Hydraulic Brakes and Clutches.
- ★ Absence of Mechanical Troubles.
- ★ Automatic and Ample Lubrication.
- ★ Mechanism Protected by Automatic Control.
- ★ Extraordinary Hardness of Bed.
- ★ Available with Large Turrets for carriage which fully utilize the Great Power Capacity of these machines; and Beds on both ends of Headstock.

Lehmann MACHINE COMPANY

CHOUTEAU AT GRAND ★ ST. LOUIS 3, MISSOURI

The new art of molding a powdered metal part

The Metal Carbides Corporation, Youngstown, Ohio, are applying the new science of powder metallurgy for forming tools and dies out of tungsten carbide. When formed of powdered metal in this new Lake Erie hydraulic powder metal press the finished product requires no machining other than grinding.

This latest development of Lake Erie's skilled engineering staff... which, in addition to tungsten carbide is suitable for molding powdered bronze, aluminum, copper, iron and various other metals and combinations... is a four column, double action, self-contained press with a capacity of two hundred tons. Opposing rams produce a finished piece of uniform density throughout. One of its special features is a feeding device which operates as part of the automatic cycle. Continuous production of pressed parts is thereby made possible by keeping the feeding box loaded.

If you are considering the advantages of powder metallurgy in manufacturing your own products, investigate Lake Erie's ability to furnish you this standard press or build you a special press to your specific requirements. Write for further details.

LAKE ERIE ENGINEERING CORP.
170 Woodward Avenue Buffalo 17, New York
Offices in Principal Cities . . . United States and Countries

LAKE ERIE
ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

UNBRAKO

Reg. U. S. Pat. Off.

You can rely on the "Unbrako" Knurl Pointed Socket Set Screw (above), because it "stays put" and resists all attempts of vibration to shake it loose! It's the knurled cup point that assures this firm grip . . . the knurls dig-in and HOLD. Despite this tenacity against vibration, however, these screws can easily be backed out with a wrench and used again and again.

Knurling of the head of the "Unbrako" Socket Cap Screw (left) provides a firm grip, even for oily fingers. Speeds production—saves time, for the "Unbrako" can be screwed-in farther and faster by hand before a wrench is needed.

Both screws are available in sizes from No. 0 to 1½" in diameter—full range of lengths. For more information, write for our "Unbrako" Catalog.

Knurling of Socket Screws originated with "Unbrako" years ago.

OVER 40 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 22. BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

HAZARD	RESPIRATOR R-1000 A	T	AD	CC1	CC2	CC3	CC4	R-9100 A	T
Cobalt (dust)	X		x					x	
Coke (dust)	x		x					X	
Collodion (vapor)				X					
Copper (dust)	x		x					X	
Cotton (dust)	x							X	
Cupric oxide (dust)	X								
Creosote (vapor)									
Cyanide powders (dust)									
Cyclo Hexanol (vapor)									
Cyclo Hexanone (vapor)									
Diacetone alcohol (va									
Diethylene oxide (va									
Dioxylene (vapor)									
Dioxane (vapor)									
Drug dusts									
Dye powders									
Emery dusts									
Esters (vapor)									
Ethers (vapor)									
Ethyl acetate (vap									
Ethyl Chloride (g									
Flint (dust)									
Flour (dust)									
Fluorine (gas)									
Formaldehyde (va									
Formaldehyde with oxide (gas)									
Foundry parting co (dust)									
Furfural (vapor)									
Gasoline (vapor)									
Glass (dust)									
Grains (dust)									
Granite (dust)									
Graphite (dust)									
Gypsum (dust)									
Household dusts									
Hydrochloric acid (gas or mist)									
Hydrochloric acid combined with nitric acid (gas or mist)									
Hydrogen bromide (gas)									
Hydrogen sulphide (gas)				x	X				X

HAZ

Methyl Chlorid
Mica (dust)
Muriatic acid
Muriatic ac
Sulphuric a
Naphthas (vapor
Naphthalene (vap
Nickel (dust)
Nicotine (dust)
Nitric acid (gas or
Nitric acid combin
phuric acid (gas o
Nitrobenzene
Organic Dusts
Paint Spray (
Paper (dust)
Phenol (vapo
Phenol with
cide (vapor
Phosphorus co
Phosphorus Ac
Phosphorus
Plastic (dust)
Pollens
Quartz (dust)
Rubber (dust)
Salammoniac
Sand (dust)
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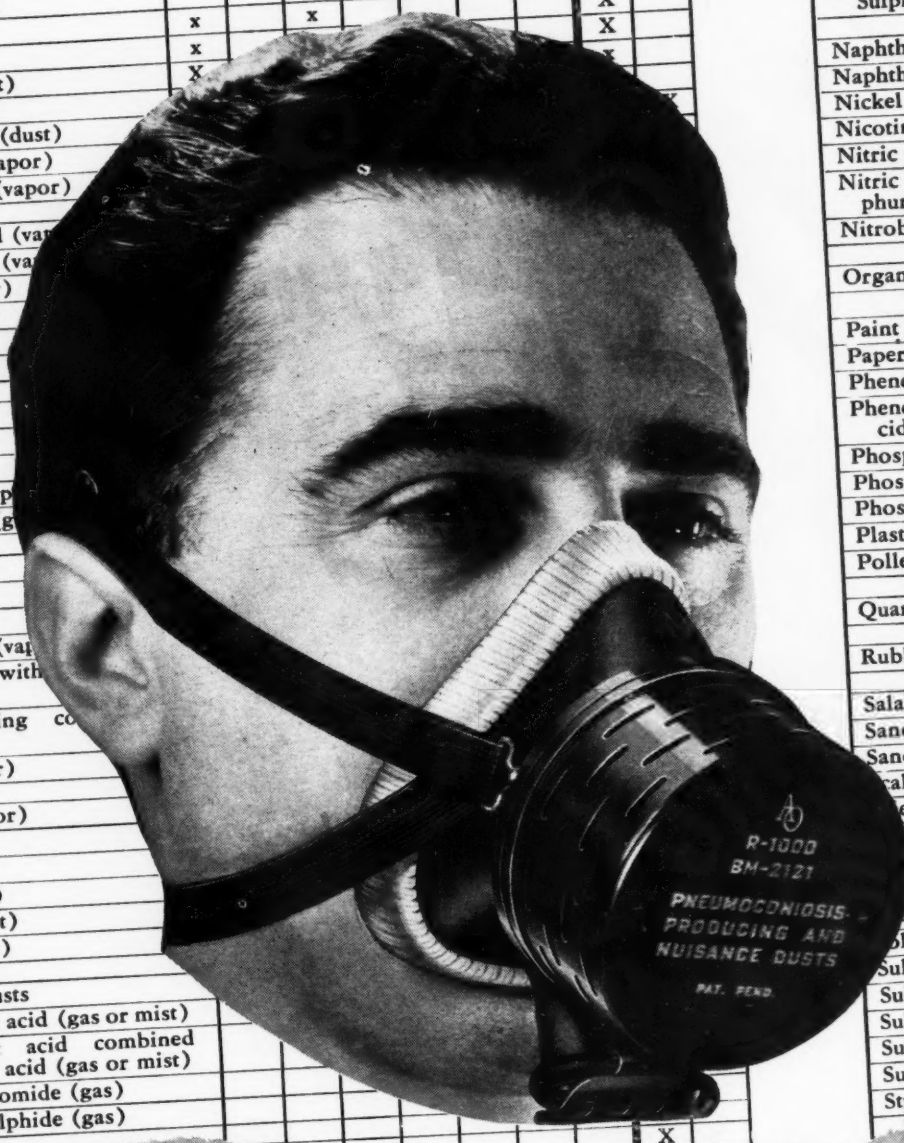


AO R-1000 Means—7 Respirators in 1

The AO R-1000 Respirator is equipped with seven interchangeable cartridges, providing protection against more than 140 types of dust, vapors and gases.

Adaptability of design, pliability of rubber, and smoothly rounded face-contacting edges make it possible to fit the AO R-1000 to any face safely, comfortably and without adjustment.

Exhalation valve assures complete expulsion of exhaled air, even when worker's head is down; can't stay open or fill with moisture; dust cannot infiltrate.

Inhalation valve provides positive protection under all conditions; holds re-breathing to minimum; keeps efficiency at high level; admits air at the lightest intake of breath.

Your nearest AO Representative will be glad to demonstrate.

Send for your AO Respirator Guide—showing proper protection against more than 140 respiratory hazards.

American Optical

COMPANY

SOUTHBRIDGE, MASSACHUSETTS

WHAT DO YOU NEED IN A CLUTCH OR COUPLING?

. . . . . PRECISION?

. . . . LOAD CAPACITY?

. . FAST PRODUCTION?

GLEASON CURVIC* COUPLINGS give you all 3

GLEASON CURVIC COUPLINGS join permanently in perfect alignment the three members of a built-up crankshaft for a two-throw radial aircraft engine.

A precision connection of a new type is now available for use in permanent couplings and releasing couplings (clutches). These couplings have teeth of radial direction and parallel depth, cut and ground into the faces of the connected parts.

Gleason Curvic Couplings are produced on the same Gleason cutting and grinding machines used for curved-tooth bevel gears . . . hence, they have the same high degree of accuracy and fast rate of production.

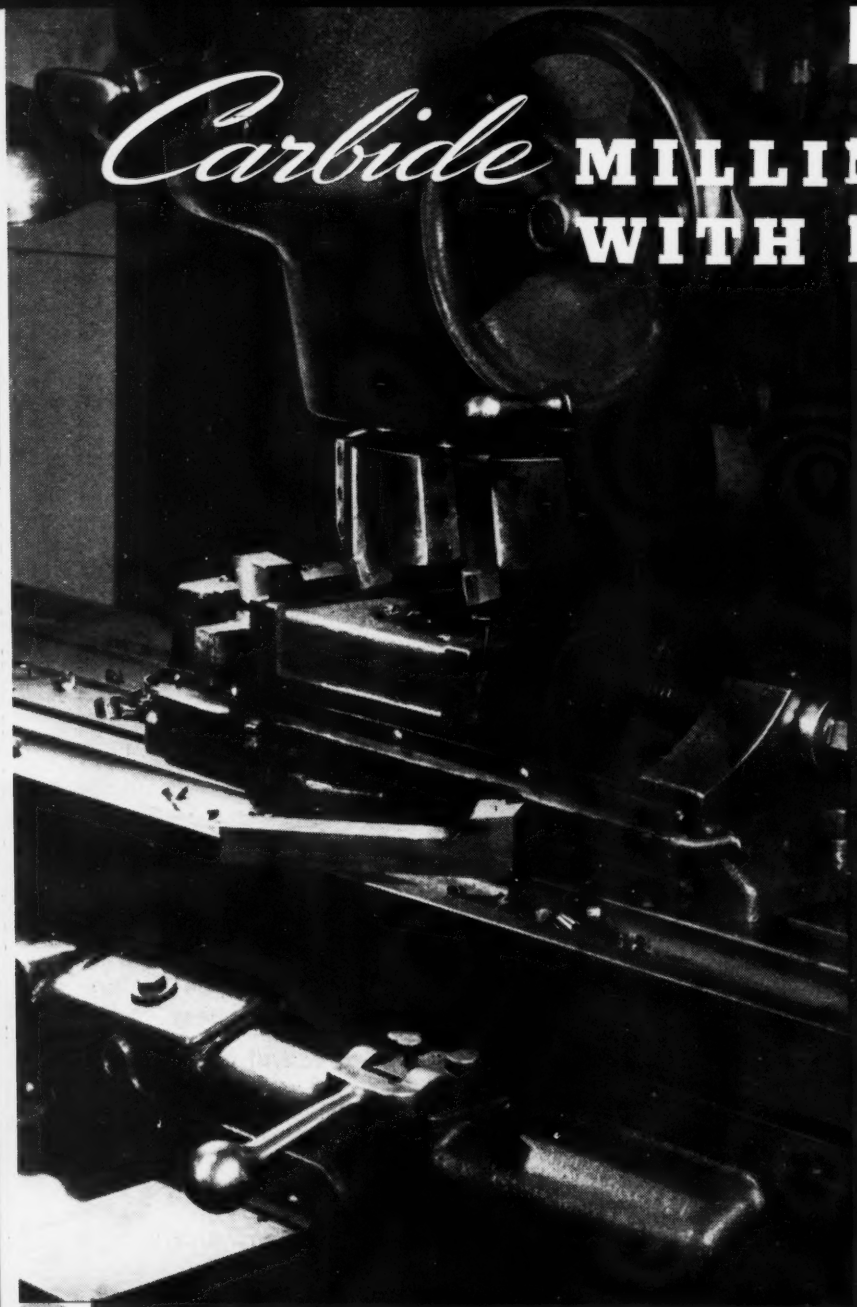
The Curvic design provides a precision, light, compact, and self-contained connection in which the teeth both center and drive. The accuracy and uniformity are such that complete interchangeability is possible, facilitating manufacture and assembly of the coupled parts.

Investigate the advantages of Gleason Curvic Couplings for your clutch and coupling applications. Write on your company letterhead for descriptive brochure.

GLEASON Works
Builders of BEVEL GEAR MACHINERY FOR OVER EIGHTY YEARS

*TRADE MARK

1000 UNIVERSITY AVENUE
ROCHESTER 3, NEW YORK



Carbide MILLING OF STEEL WITH EXCEPTIONAL

READ THIS PERFORMANCE REPORT:

The illustration shows an interesting high-speed milling operation performed on a vertical model CSM milling machine at the Wendt-Sonis Company, Hannibal, Missouri.

The work-piece is S.A.E. 1095 steel, hardness 18 Rockwell C. 4½ cubic inches of metal are removed in only two passes; the first cut is 7/16 inch deep, the second 5/16 inches deep. The finish on the cut metal is unusually good. An 8 inch 6 blade Wendt-Sonis face milling cutter is used for the operation, running at 342 rpm (682 sfm) with a table feed rate of 17½ inches per minute.

Concerning the performance of the CSM milling machine, Mr. Del Rhino, Wendt-Sonis Plant Superintendent, enthusiastically says "We have increased our production eight to ten times over our previous method of milling this workpiece. We have experienced similar increase in the production rate on other jobs we have milled with this machine. We are not alone pleased with the performance of the CSM machine but also with its ease of operation."

REPRESENTATIVE USERS OF THE KEARNEY & TRECKER 50hp CSM MILLING MACHINE

GLENN L. MARTIN COMPANY
- - Middle River, Baltimore City, Maryland

BOEING AIRCRAFT — for Iron Fireman
- - 4784 S. E. 17th Avenue, Portland, Ore.

DEFENSE PLANT CORP.
- - - Fisher Body Division, Flint, Michigan

IRON FIREMAN MFG. COMPANY
- - 4784 S. E. 17th Avenue, Portland, Ore.

WENDT-SONIS COMPANY - - Hannibal, Missouri

GENERAL AIRCRAFT EQUIPMENT COMPANY
- - - - - - - South Norwalk, Conn.

KENNAMETAL, INCORPORATED - - Latrobe, Penn.

CHANCE VOUGHT AIRCRAFT,
- Div. of United Aircraft Corp., Stratford, Conn.

MATTISON MACHINE WORKS - - Rockford, Illinois

A. O. SMITH CORPORATION - Milwaukee, Wisconsin

CATERPILLAR TRACTOR COMPANY - Peoria, Illinois

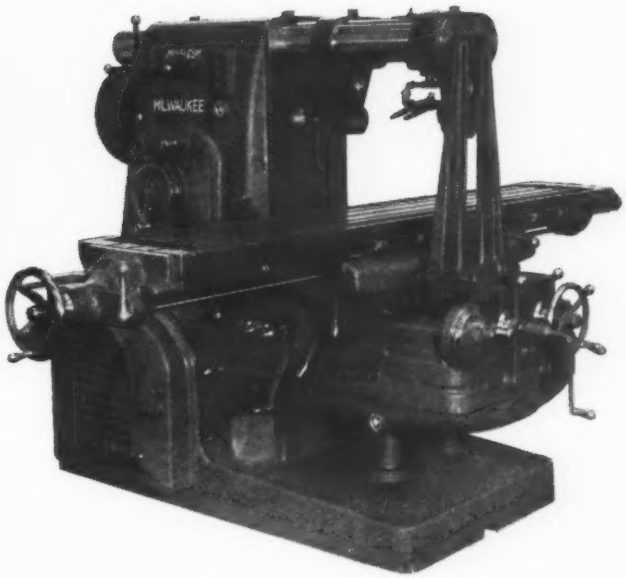
LANDELIUS & BJOERKLUND - - Stockholm, Sweden

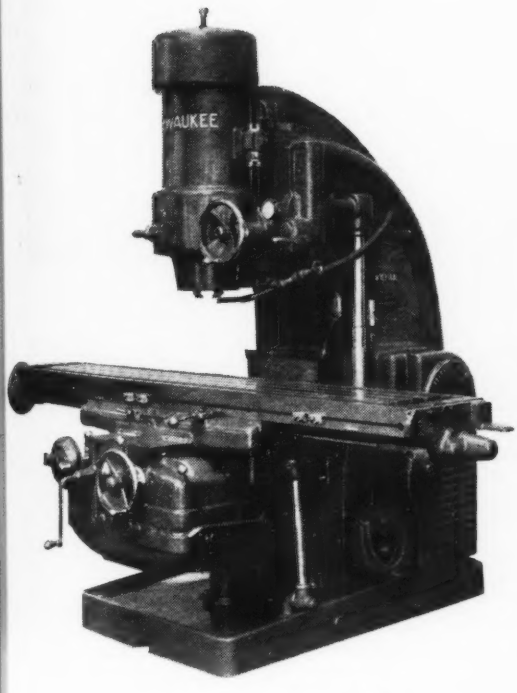
INGERSOLL MILLING MACHINE COMPANY
- - - - - - - - - Rockford, Illinois

KEARNEY & TRECKER CORPORATION

. . . AT *HIGH SPEED* . . .
EASE OF OPERATION

THE KEARNEY & TRECKER 50 hp CSM MILLING MACHINE

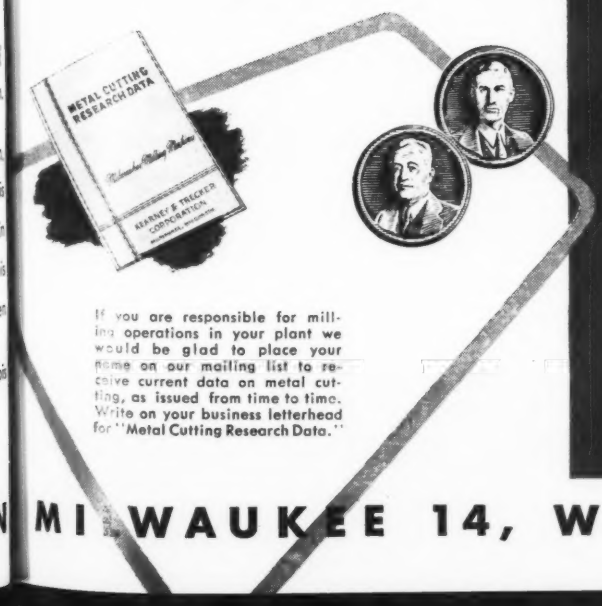




The 50 hp CSM is an all purpose milling machine, specially engineered and built to meet the demands of Carbide Steel Milling—a comparatively recent development in high speed milling. It is a rugged, massive machine having great rigidity and equipped with ample power for the increased rate of metal removal made possible through the application of carbide cutters.

A heavy flywheel, mounted on the spindle, assists in providing and maintaining a uniform flow of power to the spindle. Direct power to the gear trains in the saddle and knee is supplied by a 5 hp motor mounted on the side of the knee. Speed changes and cutter positioning are facilitated by means of a conveniently accessible electric inching button. An electric spindle brake provides for almost instant stopping of the spindle.

Designed and constructed expressly to meet modern demands for increased high-speed production the CSM milling machine will not only handle carbide steel milling operations with ease and speed but also regular and heavy milling jobs to perfection.



If you are responsible for milling operations in your plant we would be glad to place your name on our mailing list to receive current data on metal cutting, as issued from time to time. Write on your business letterhead for "Metal Cutting Research Data."

MILWAUKEE 14, WISCONSIN

Kissing AT 50,000 R.P.M.

"Osculation" and "oscillation" just don't go together when the kissing steps up to 50,000 r.p.m. and better ... and the work is measured in the ten-thousandths of an inch. Bearings must be as frictionless as possible ... and yet rigid enough to hold accurate peripheral limits. The only bearing that can function with minimum friction and necessary rigidity within such tolerance limits is a ball bearing.

Fafnir has made the narrowing down of permissible tolerances in extreme precision types of ball bearings its special field. It's a wholly different job of bearing manufacturing. It begins with critical selection of steels and a special heat treatment, with different methods of precision race grinding, ring construction and precision preloading. Matching eccentricities of individual balls and of pairs of bearings has reduced tolerance limits to the almost incredible measurement of hundred-thousandths of an inch. At the same time, life expectancy of such bearings has been raised as high as 8000 hours, running at 50,000 r.p.m. and better.

It's the way Fafnir has of getting the focus on really tough bearing problems that has created the unique Fafnir Line ... a line of made-to-specifications bearings ... and the "most complete line of ball bearings in America". It's the reason so many industries have found that they save both time and money by putting bearing problems up to Fafnir first. The Fafnir Bearing Company, New Britain, Connecticut.

MOST COMPLETE LINE IN AMERICA

FAFNIR BALL BEARINGS

Save these for work a machine can't do

HC-3 — ½ H. P., multi-speed countershaft unit, 900 to 3600 R. P. M. Mounted bench-height on 3-leg caster base, 360° swivel.

There was a time, not so many years ago, when the words "Made by Hand" were synonymous with highest quality. In some things this still holds true.

But it is equally true that many operations can be done better and faster, with a greater degree of efficiency, when a Haskins Flexible Shaft Machine is used. And this with much less strain and fatigue on the part of the operator.

Grinding—Sanding—Rotary filing—Wire brushing—Buffing and Polishing—all are machine operations. There are many more. Write for Catalog 45, showing many ways to save your hands and speed production with flexible shaft equipment.

R. G. HASKINS CO.
617 South California Ave., Chicago 12

HASKINS

haskins
FLEXIBLE SHAFT EQUIPMENT

Check your cost on repairing punches & dies sheared through incorrect setups . . .

. . . then see a

WIEDEMANN

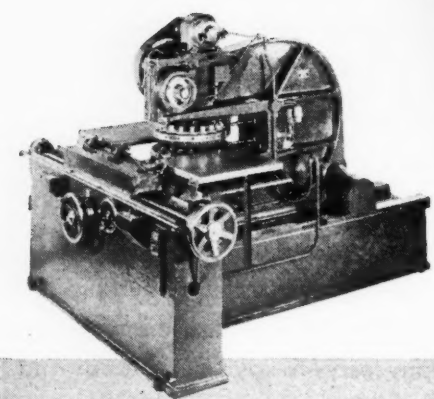
A Wiedemann Turret Punch Press handles short run piercing operations at long-run high speed and low cost . . . **impossible to shear punches and dies.** Why? Both upper and lower turrets are synchronized assuring perfect alignment of the punch and die. A positive locking device locks the turrets at the desired station so that **the ram cannot be tripped until both turrets are locked into the desired position.** There are from 11 to 32 punches and dies carried in the turret always ready for instant piercing.

Send for the complete story of short run piercing economy . . . Bulletin 92. Read how some users report savings up to 2000% in labor alone by using a Wiedemann Turret Punch Press.

WIEDEMANN MACHINE COMPANY

1807 SEDGLEY AVENUE • PHILADELPHIA 32, PA.

Canadian Representative: HOPE MACHINE CO., 21 KING ST., E., TORONTO 1, ONT., CONFEDERATION BUILDING, McGILL COLLEGE AVENUE, MONTREAL, QUEBEC



TEMPLATES ACCURATE TO ±.002" PRODUCED WITH A WIEDEMANN R-43 IN A FRACTION OF TIME TAKEN BY ORDINARY METHODS

New and revolutionary times have been set on accurate template making with the R-43 Micro Turret Punch Press.

The templates are punched, the hole size accurately maintained, and overall center distances held to ± .002". Two rotating turrets carry the required punches and dies, and thereby eliminate individual set up. A safety mechanism prevents tripping the press until the turrets are locked in alignment . . . shearing of punches and dies is eliminated.

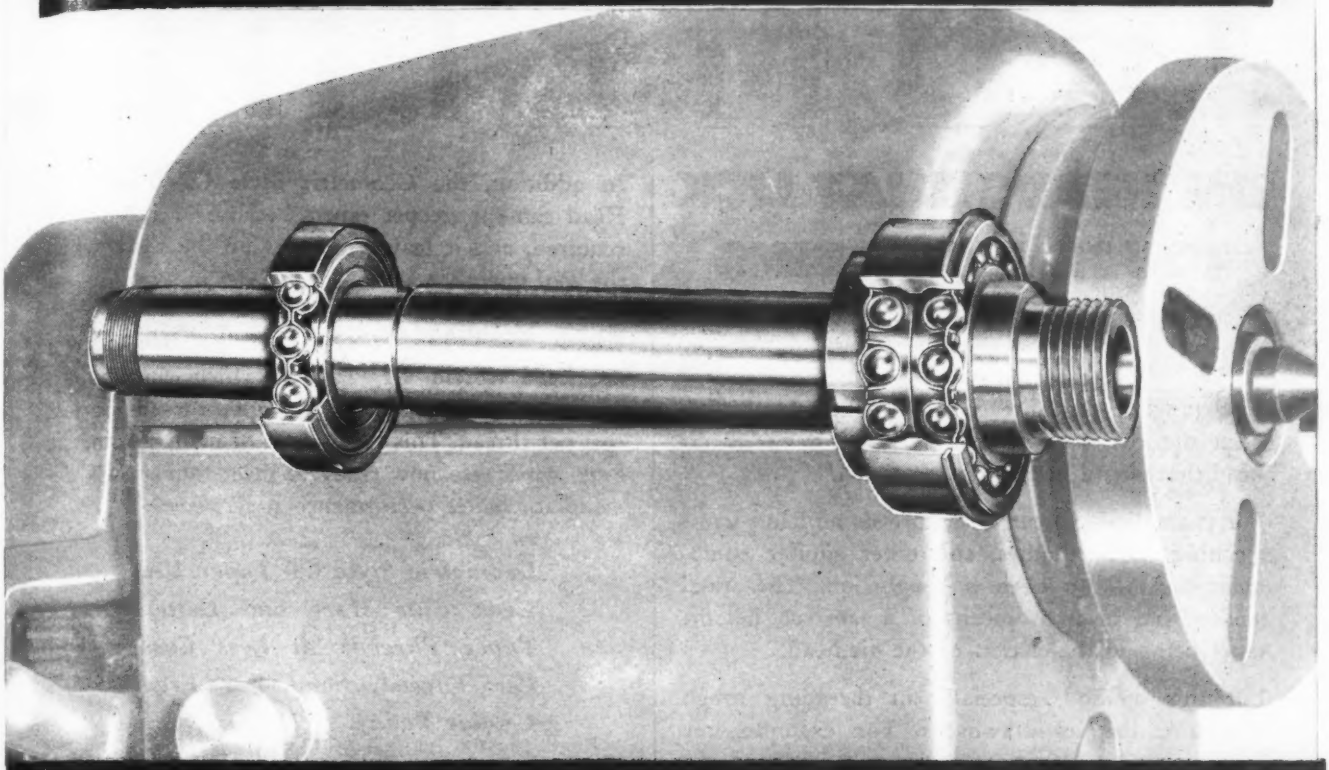
No layout is necessary. Accurate lead screws, with direct reading dials graduated in thousandths of an inch, assure easy positioning and accurate dimensions.

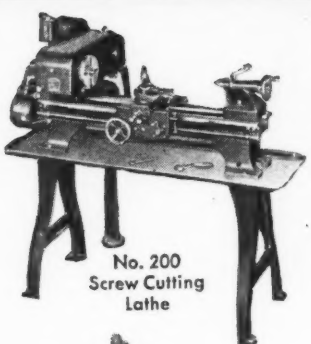
The lead screws operate at right angles to each other, are absolutely square with each other.

Dimensioning can be done from the ends of the template or from the center lines.

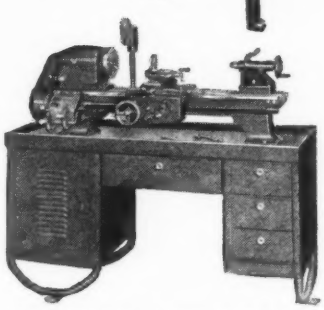
The Micro Turret Punch Press is a method of production whereby all elements necessary to produce accurate templates, inspection piercing templates and many types of flat drill jigs have been combined for maximum efficiency of motion and effort.

Logan A NAME TO REMEMBER WHEN YOU THINK OF BETTER LATHES





No. 200
Screw Cutting
Lathe



No. 825 Cabinet Model
Quick Change Gear Lathe

SPECIFICATIONS common to all Logan Lathes: Swing over bed, 10½", Bed width across ways, 6-15/16", Bed length, 43⅛", Size of hole through spindle, 25/32", Spindle nose diameter and threads per inch, 1½"—8, 12 Spindle speeds, 30 to 1450 r.p.m., size of motor, ⅓ or ½ h.p., 1750 r.p.m.; Preloaded precision ball bearing spindle mounting; Drum type reversing motor switch and cord; Precision ground ways, 2 prismatic "V" ways, and 2 flat ways.

Higher Cutting Speeds Without Bearing Adjustment on *Logan* LATHES

THE pre-loaded ball bearing spindle mounting is one of the advanced design features which make Logan Lathes specially adapted to the needs of modern shops. With the resulting increased spindle speeds, full advantage can be taken of the high cutting speeds used with carbide cutting tools. No bearing adjustment is required within the full range of Logan spindle speeds, from 30 r.p.m. to 1450 r.p.m., regardless of the cut being taken. With Logan Lathes, consequently, the precise factory alignment of the spindle is not disturbed by periodic bearing adjustments, and original spindle accuracy is sustained. Grease-sealed, the ball bearings require no further lubrication or attention throughout their long service life. Maintenance costs and down time are kept at a minimum. The ball bearing spindle mounting is another reason why Logan Lathes increase output and decrease unit costs on production lines, and reduce the man-hours per cutting job in tool rooms. For full information on all models of Logan Lathes, see your nearest Logan dealer, or write direct for descriptive catalog.

F-1

LOGAN ENGINEERING CO.

CHICAGO 30, ILLINOIS

GEOMETRIC

Simple · Accurate · Economical

DIE HEADS THAT LICK TOUGH THREADING PROBLEMS

The tougher the threading job, the greater has been the challenge to Geometric to devise a die head that would lick it.

For example — to cut taper threads on hand screw machines, turret lathes, and other similar equipment has always been a tough job. The usual method has been by means of a jam cut, i.e. the taper being in the chasers of the die head.

But this method, especially in threading tough materials, has its drawbacks. For example, the longer the cut, the more power required and the greater the *strain* on the chasers. Also the length of the taper is limited by the height of the chasers. And finally, jam cut chasers often leave lines on the work.

Geometric's answer to all these problems has been the development of its Style CT Taper Die Head. It makes cutting taper threads simple and easy.

Less Power

Because the Style CT Taper Die Head cuts a taper thread just as an ordinary die head cuts a straight thread — with the chamfer plus the first full tooth doing the work.

Greater Lengths

Because the length of the taper is not limited to the height of the chaser, as is the case with a jam cut.

Greater Accuracy

Because the taper on the finished thread is controlled by a positive angle on the taper bar.

In addition, the Geometric Style CT Taper Die Head can cut steeper tapers because of less power required, and it leaves no lines on the work when the tool opens.

THE RESULT: Geometric has developed a die head (Style CT Taper) which cuts better, smoother, and more accurate taper threads at less cost per thread. This is only one of many Geometric tools which are now ready to meet tomorrow's demand for better performance at less cost.

Geometric Style CT Taper Die Head Cuts More and Better Taper Threads At Less Cost Per Thread. Send For Free Catalog Today.

The GEOMETRIC TOOL COMPANY
New Haven 15 Connecticut

A DIVISION OF THE GREENFIELD TAP and DIE CORPORATION

FOR BETTER GAGING . . . "GO" GREENFIELD

ARE YOU USING

Chromium Plated

THREAD GAGES for EXTRA WEAR?

The longer life of chromium plated gages more than makes up for their high first cost and results in worthwhile net savings.

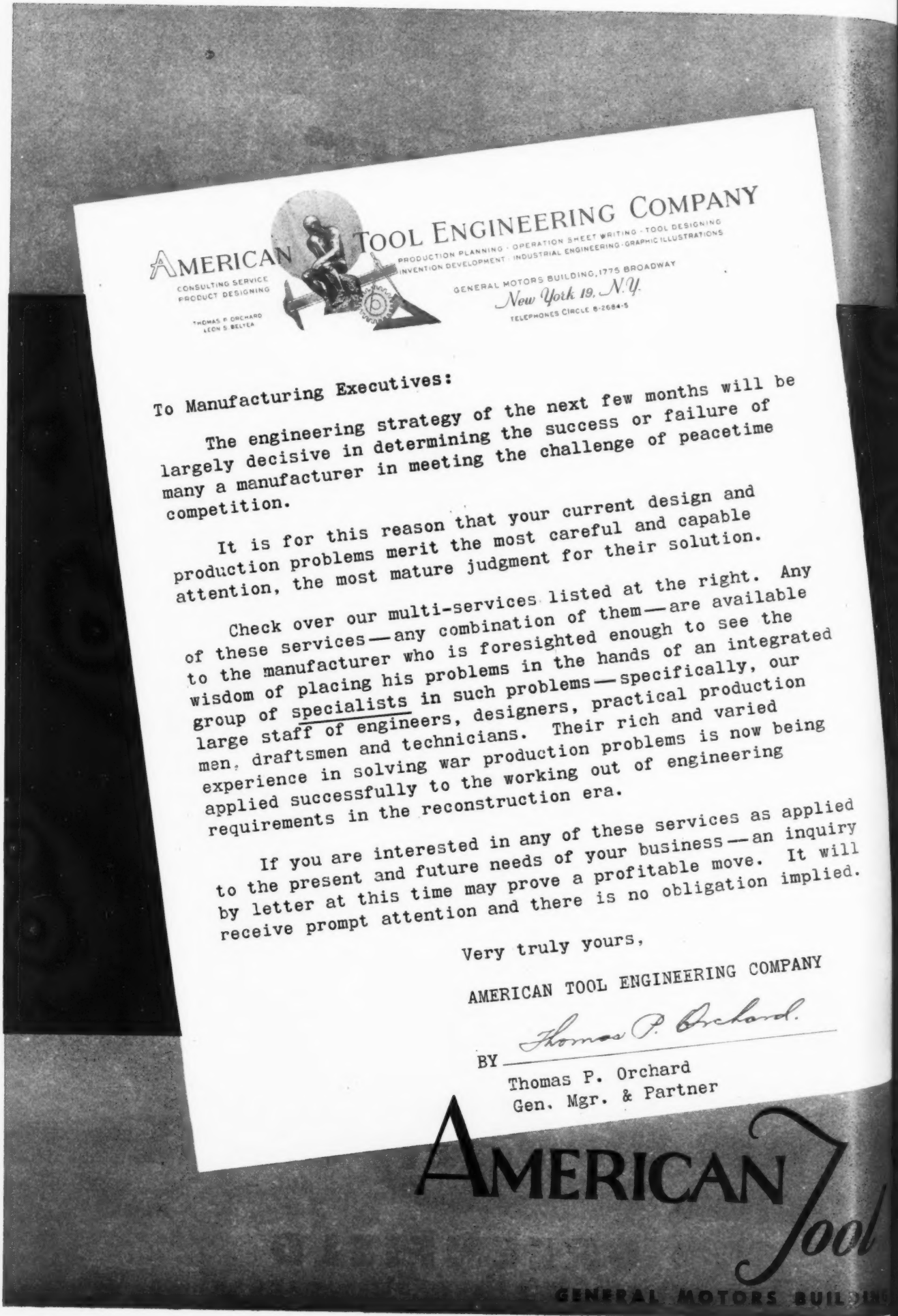
While "Greenfield" has supplied chromium plated gages for many years, wartime expansion of facilities and research has enabled us to greatly improve our methods and quality. Now we can furnish a vastly superior product including Thread Gages as well as plain gages.

For further information on "Greenfield" chromium plated gages, call your "Greenfield Man" through your local "Greenfield" distributor.

GREENFIELD

GREENFIELD TAP and DIE CORPORATION

GREENFIELD, MASSACHUSETTS


AMERICAN TOOL ENGINEERING COMPANY
CONSULTING SERVICE
PRODUCT DESIGNING
PRODUCTION PLANNING · OPERATION SHEET WRITING · TOOL DESIGNING
INVENTION DEVELOPMENT · INDUSTRIAL ENGINEERING · GRAPHIC ILLUSTRATIONS
THOMAS P. ORCHARD
LEON S. BELYEA
GENERAL MOTORS BUILDING, 1775 BROADWAY
New York 19, N.Y.
TELEPHONES CIRCLE 6-2684-5
To Manufacturing Executives:
The engineering strategy of the next few months will be largely decisive in determining the success or failure of many a manufacturer in meeting the challenge of peacetime competition.
It is for this reason that your current design and production problems merit the most careful and capable attention, the most mature judgment for their solution.
Check over our multi-services listed at the right. Any of these services—any combination of them—are available to the manufacturer who is foresighted enough to see the wisdom of placing his problems in the hands of an integrated group of specialists in such problems—specifically, our large staff of engineers, designers, practical production men, draftsmen and technicians. Their rich and varied experience in solving war production problems is now being applied successfully to the working out of engineering requirements in the reconstruction era.
If you are interested in any of these services as applied to the present and future needs of your business—an inquiry by letter at this time may prove a profitable move. It will receive prompt attention and there is no obligation implied.
Very truly yours,
AMERICAN TOOL ENGINEERING COMPANY
BY Thomas P. Orchard
Thomas P. Orchard
Gen. Mgr. & Partner
AMERICAN Tool
GENERAL MOTORS BUILDING

PRODUCT DESIGN

PRODUCT DEVELOPMENT

TOOL DESIGN

PRODUCTION PLANNING

INVENTION DEVELOPMENT

GRAPHIC ILLUSTRATION

OPERATION SHEET WRITING

DESIGN OF SPECIAL AND AUTOMATIC MACHINERY

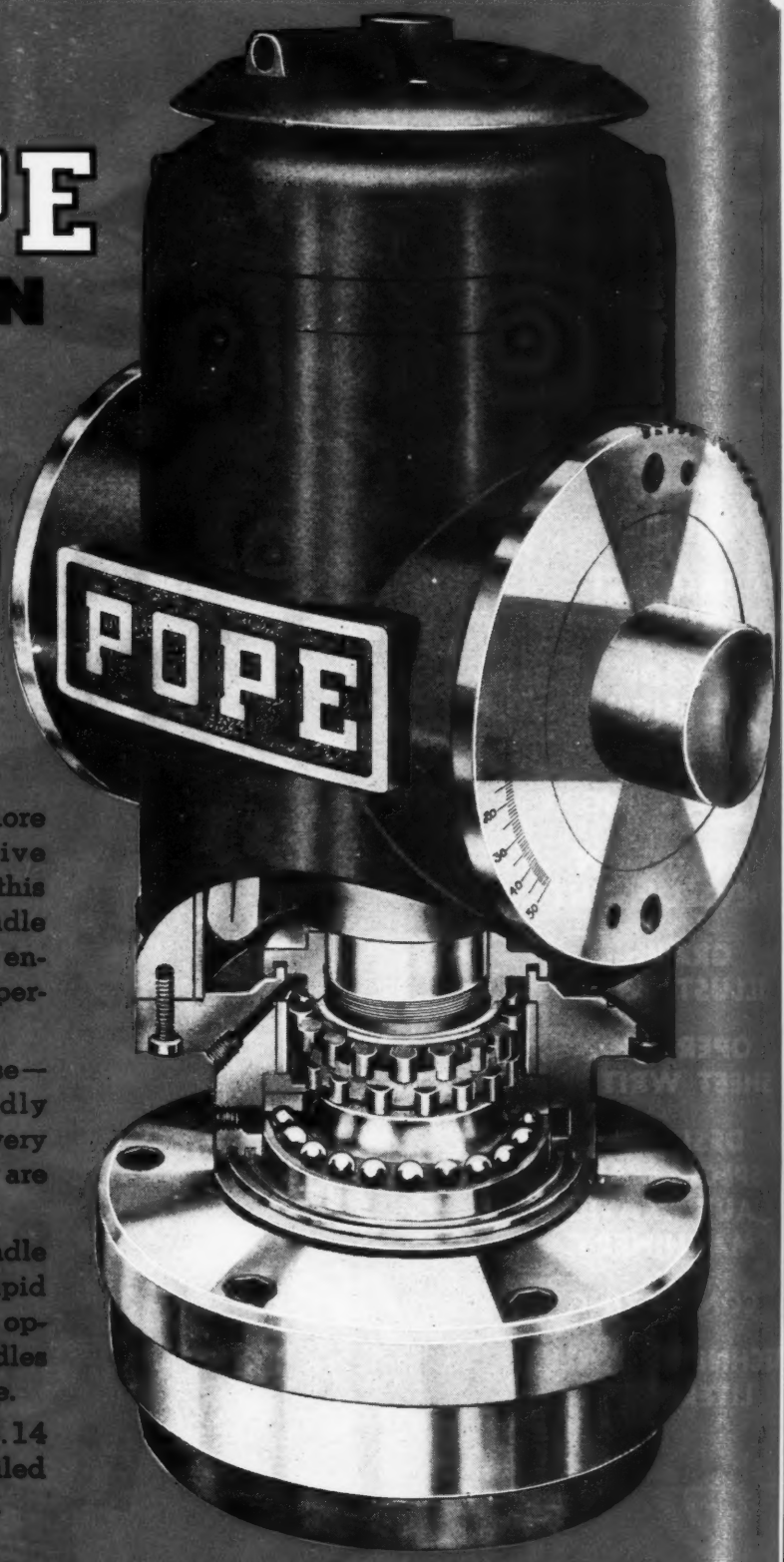
CONSULTING

TECHNICAL SALES LITERATURE

Engineering Company

1775 BROADWAY, NEW YORK 19, N. Y.

THE POPE PRECISION SPINDLE *for your* DIAMOND WHEELS



You'll get longer life as well as more accurate work out of expensive diamond wheels when you use this POPE Vertical Motorized Spindle with *sealed lubrication*, totally enclosed fan cooled motor and super-precision bearings.

It is designed for the purpose—dynamically balanced, rigidly constructed and runs within very close tolerances. Good finishes are assured.

The POPE Diamond Wheel Spindle has provision for precise and rapid mounting of the wheel. It may be operated at any angle. These spindles are also available with belt drive.

Ask us to mail you Data Sheet No. 14 from which we can supply detailed recommendations and estimates.

POPE

POPE MACHINERY CORPORATION

ESTABLISHED 1920

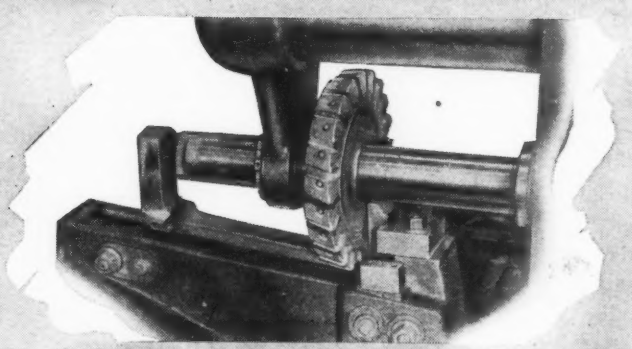
261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

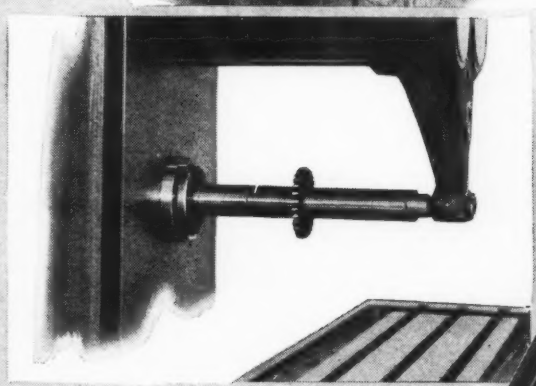
KEARNEY & TRECKER

Milwaukee ARBORS

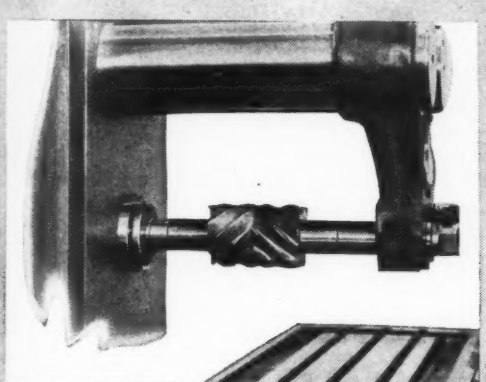
STANDARDIZED AND INTERCHANGEABLE ... FOR ALL STANDARD MILLING MACHINES



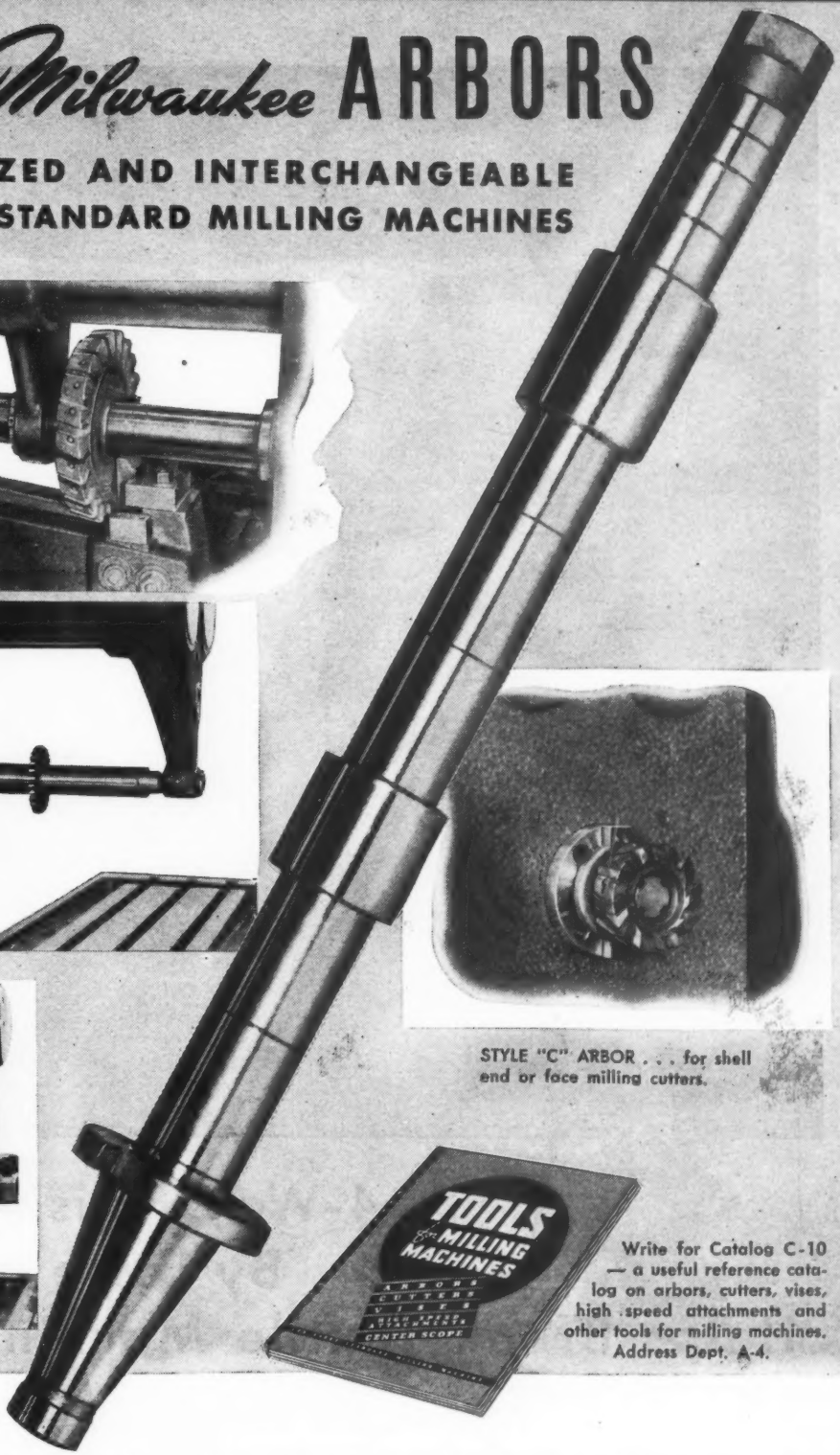
STYLE "B" ARBOR . . . for heavy cuts. Wide selection of lengths and diameters for any required operation.



STYLE "A" ARBOR . . . normally used on light cuts. Pilot end provides maximum clearance between arbor and workpiece or holding-fixture.



STYLE "C" ARBOR . . . for shell end or face milling cutters.

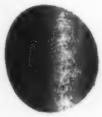


Write for Catalog C-10 — a useful reference catalog on arbors, cutters, vises, high speed attachments and other tools for milling machines. Address Dept. A-4.

A good arbor is essential to get the best in performance from your milling machines.

Milwaukee arbors are precision tools—their use provides milling accuracy, long arbor and cutter life, profitable performance.

You can use Milwaukee arbors on any standard milling machine in your plant, equipped with a National Standard Spindle End. For complete information on arbors and milling tools, write for Catalog C-10.



BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • MIDGETMILL • SPEEDMILL • FACE MILL GRINDER • AUTOMETRIC JIG BORER • CENTERSCOPE.

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Products
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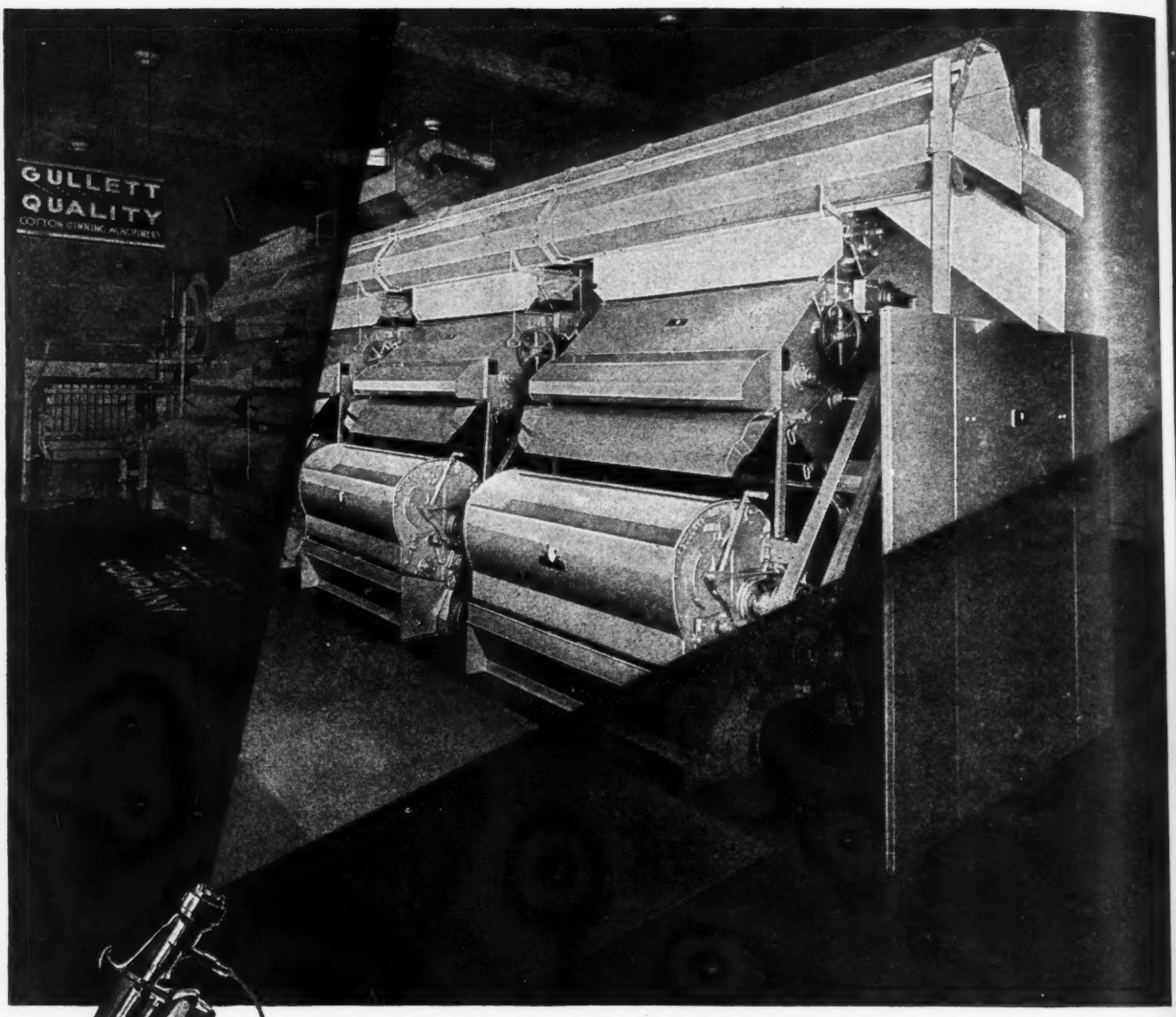
Subsidiary of Kearney & Trecker Corporation



4-Way Finishing Service By Lowe Brothers Helps Break Textile Machinery Bottleneck

The Textile Industry was faced with a desperate shortage of processing equipment! A well-known Southern manufacturer had to reconvert back from making shells to cotton gins — *and fast*. More gins and parts than ever before were needed!

Lowe Brothers received an urgent call for a finishing system that would step up production sharply without sacrifice to appearance or durability.

Soon a Lowe Brothers Finishing Specialist came through with recommendations for this 4-way time saving, finishing service.

1 ***Time was saved*** **by a new Lacquer finish which supplanted a previously used Enamel system. Applied *quickly* this new finish *also reduced the drying* time between coats.**

2 ***Time was saved*** **by having castings coated at the foundry with an anti-corrosive primer. This eliminated the expensive rust-cleaning operation which was previously necessary on the castings stored outside for the seasoning period.**

3 ***Time was saved*** **by a new spray-applied Lacquer Base Filler for cast iron parts. This eliminated the time and labor of hand-glazing and sanding under previous method.**

4 ***Efficient application was assured*** **by a Lowe Brothers Expert who followed the materials to the job. In addition, he recommended adjustments in the formulas to compensate for climatic conditions. Result, a practical system of finishing *more cotton gins than ever before*** **with a lasting and attractive finish.**

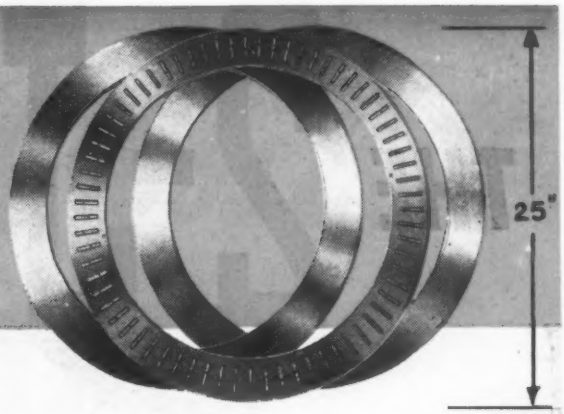
Why not let Lowe Brothers supply you with finishes and service that will *speed production and hold costs down—from here on out.*

INDUSTRIAL SALES
THE LOWE BROTHERS CO.
Dayton, Ohio

KEEP ON BUYING WAR BONDS

Lowe Brothers FINISHES for Industry

The specifications read like a "Dream" Bearing...



...but it did a gruelling job in 155 mm. "Long Tom" Guns!

When Pettibone Mulliken Corp. sent us specifications of the thrust bearings required in the gun mounts of the 8" Howitzers and 155 mm. "Long Tom" guns, it looked at first glance like one of those "impossible" jobs. Just study these requirements:

Size: 25" diameter. Overall thickness: two plates, plus rollers, only 1½". Material of construction: hardened stainless steel throughout. Special problems: precision machining, grinding and heat-treating of stainless steel. Stress requirements: to withstand residual recoil from 95 lb. shells thrown 10 miles. Delivery: all we could produce in the fastest possible time, for the duration.

Licking this assignment was one of our proudest jobs. These famous guns went into action at Bougainville in 1942 and served on every front. The bearings withstood tropical punishment, salt spray and often lack of lubrication.

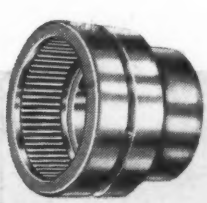
P.S This precision workmanship and reliable follow-through are plus values that go with every order for Orange Roller Bearings—whether standard or special. Write for Engineering Data Books showing full line.

ORANGE ROLLER BEARING COMPANY

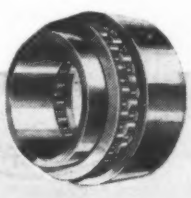
552 MAIN STREET ORANGE, N. J.

ORANGE
ROLLER BEARINGS

ROLLER BUSHINGS



STAGGERED ROLLER BEARINGS



THE 2-JOB OIL

INDUSTRIAL
TYCOL
OILS-GREASES

TYCOL INDUSTRIAL
ENGINEERED FOR EVERY

THAT DOES *Both Jobs Better*

TYCOL

DUAL PURPOSE OIL

Yes, you use only *one* oil for *both* cutting and machine lubrication, and you get better results both ways.

Better cutting performance because Tycol "Dual Purpose" increases speeds, feeds, and tool life . . . minimizes build-up on cutting tools.

Better machine lubrication, too, because this unique oil gives thorough protection to gears and bearings . . . and it won't corrode nor harmfully affect ferrous or non-ferrous metal parts.

What's the reason for this two-way superiority? Tycol Dual Purpose Oil contains precisely enough sulphur for high speed cutting, but the sulphur is in *combined* form. It won't separate, won't filter out. That's what makes Tycol Dual Purpose such an effective lubricant for automatics and other machines, as well as an exceptional cutting oil.

Why not see for yourself how Tycol Dual Purpose can step up cutting speeds and improve machine performance in your plant? For complete information call or write any Tide Water Associated office.

FREER CUTTING, LONGER TOOL LIFE

By minimizing build-up on cutting tools, Tycol "Dual Purpose" permits faster cutting — lengthens tool life between grinds.

PROTECTS BEARINGS AND GEARS

Won't corrode, or harmfully affect copper or copper alloy machine parts. Result — lower maintenance costs.

EXCELLENT WITH CARBIDE TOOLS

Tycol "Dual Purpose" brings out the best cutting performance of carbide tools, without attacking the binder.

LUBRICANTS
SERVICE NEED

TIDE WATER ASSOCIATED OIL COMPANY
17 BATTERY PLACE · NEW YORK 4, N. Y.

PRINCIPAL OFFICES
BOSTON · PHILADELPHIA
PITTSBURGH · CHARLOTTE, N. C.
TIDE WATER OIL COMPANY OF CANADA, LTD.
TORONTO · MONTREAL

Salvage

your surplus war plug gages —both plain and thread types

Plug gages of any make purchased for war production, unsuitable for your "peacetime" precision manufacturing, can be traded in on new **GO AND NO-GO Chromium Plated REVERSIBLE Gages.** The savings are substantial to users of Size Control quality gages.

These four features of Size Control **GO AND NO-GO Reversible Gages** assure even greater savings to new users:

Reversibility — provides for reversing plugs at each end of the universal handle.

Extra Length — plugs can be cut off an average of three times at each end as they become worn, giving six times more service life than ordinary gages.

Super-Finished — to minus 1-1/2 micro inches, greatly reducing friction and increasing service life.

Colored GO and NO-GO Indicators — Green GO and Red NO-GO nuts for quick identification.

GO and NO-GO Plug Gages are available in all standard sizes, from stock. Special sizes made to order of Stellite, Carbide, Norbide and up to .250" in sapphire. Bulletin No. 945 will help to cut your inspection costs.

OUTSTANDING VALUE IN PLUG GAGES

Both GO and NO-GO plugs readily reversed. Ample length to cut off end of plug when worn. Super-finished in controlled temperature and atmosphere for the ultimate in accuracy.

REVERSIBLE GO AND NO-GO THREAD GAGES

Offer the same economies and high degree of accuracy assured by plain plug gages. Readily reversible — insure six times the service life of ordinary thread gages.

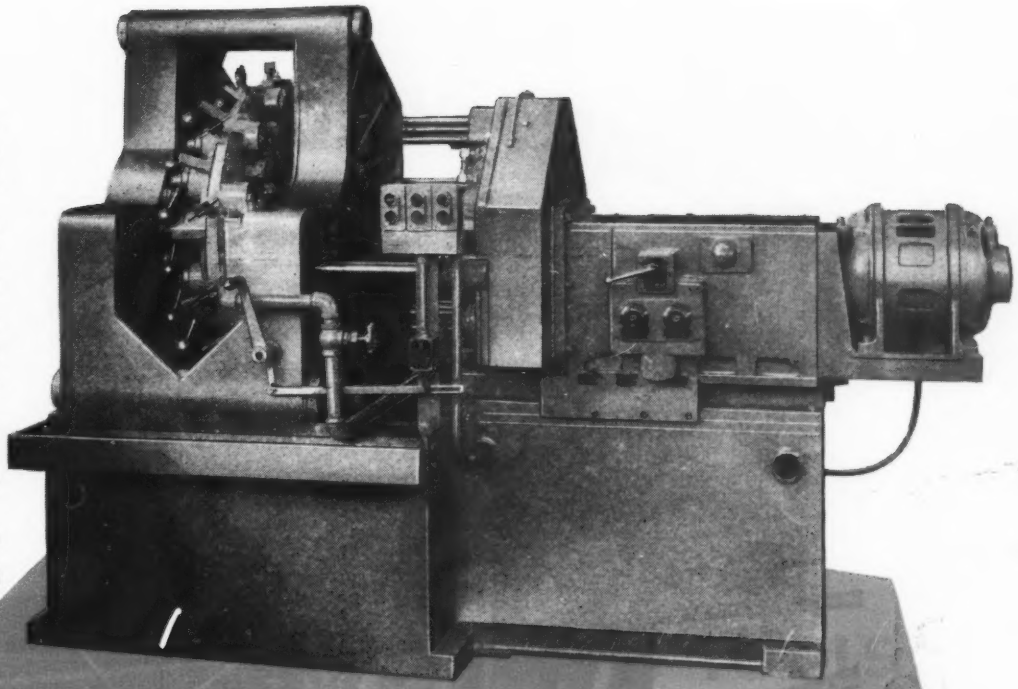
SIZE CONTROL COMPANY

DIVISION OF AMERICAN MACHINE & GAGE CO.

MAKERS OF PLAIN AND THREADED PLUG GAGES—GAGE SETS—DRILL SETS—FRACTIONAL SETS—THREAD WIRES—GEAR WIRES

Plant 4644 Fulton St. Chicago (44). Offices in Buffalo, Elmira, Rochester, Syracuse and New York City, Milwaukee, Detroit, Minneapolis, Cleveland, Indianapolis, and Greenwich, Conn.

ANOTHER MACHINE TO ASSURE SPEED AND SAVINGS IN . . .



Single and Multiple-Spindle DRILLING
BORING, REAMING, COUNTERBORING
HOLLOW MILLING, CHAMFERING, FACING

— AND AGAIN IT'S A BAKER!

This compact, self-contained one-way hydraulic feed BAKER machine—Model 7-1/2A14—is shown tooled for multiple-drilling, reaming and countersinking of Ball Nut Steering Gear parts. Material is Cast Iron. Hand-indexed trunnion type fixture (12 station) allows for loading and unloading parts while operations are being performed — meaning increased production, since the unit is not idle while operator is chucking work.

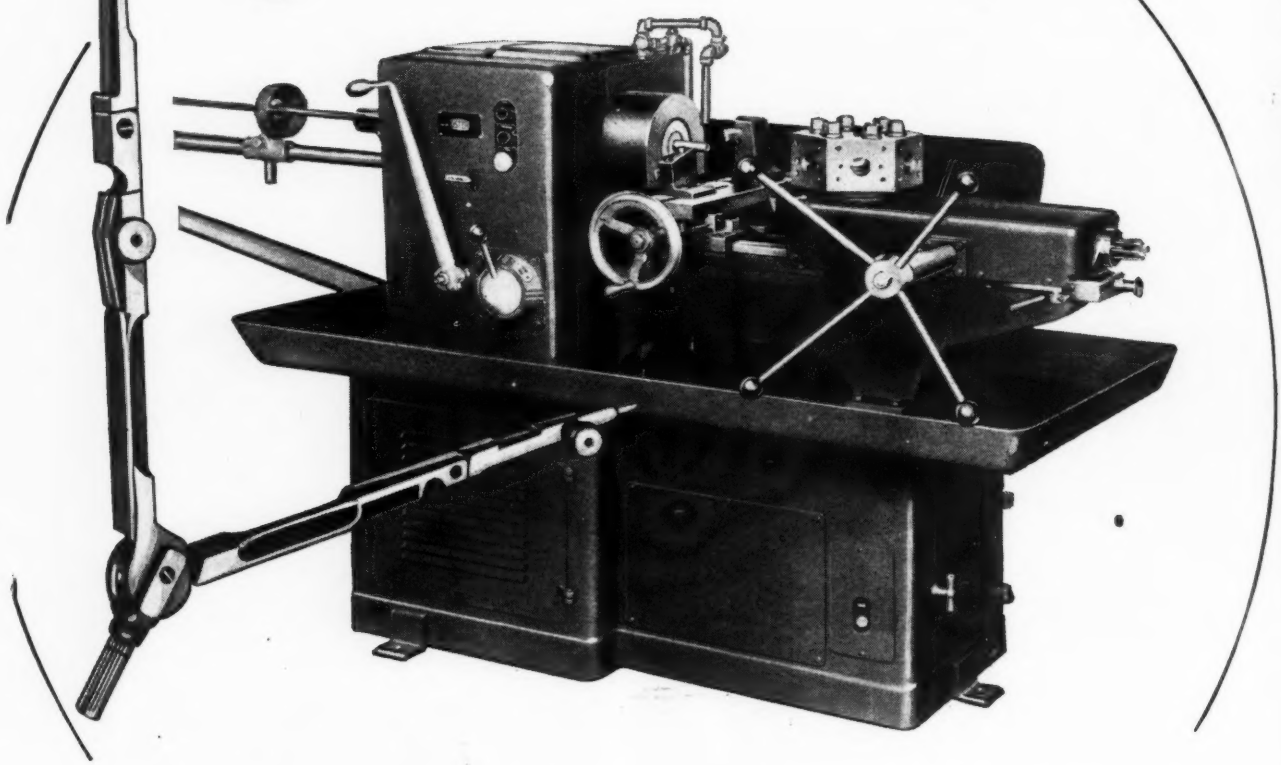
We can also furnish this type of equipment with power automatic index, as well as arranging this unit with either 2-way, 3-way or 4-way machines . . . a typical illustration of BAKER flexibility and versatility that are helping producers speed production and cut costs! Unit may be mounted on either horizontal or vertical plane.

Consult BAKER for engineering aid on your special problems in single- and multiple-spindle machining. If there is no standard BAKER unit to fill your needs, we will design special equipment. Write today, outlining your requirements.

"Machines Sturdy and Efficient, as Fine as Can be Built"

Baker Bros., INC. ★ TOLEDO 10, OHIO

WIDER CIRCLE OF APPLICATIONS



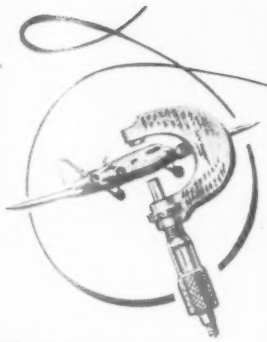
Widely used in vital war production plants as a *SIMPLIFIED* lathe on numerous bar and chucking operations, the Oster No. 601 "RAPIDUCTION" is now developed to include a still wider circle of applications. Among these recent developments are the following:

1. New 4-speed motor permits four speed changes without change of sheaves. (2-speed motor optional.)
2. Motor is mounted on oil-resistant rubber to insure smooth, quiet operation.
3. Individual ⅛ H. P. motor now operates coolant pump to provide uniform flow of lubricant, independent of spindle speeds.
4. New electrical controls have speed selector switch located conveniently for the operator.
5. Increased rigidity of the machine is insured with longer base of heavier construction.

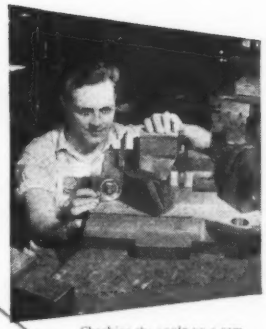
More than ever, the Oster No. 601 "RAPIDUCTION" lathe offers you "custom-built value" at an economical price. Optional WORM drive or DIRECT drive, as required. Six position turret is automatically indexed. Automatic chuck capacity 1½" round bar.

OSTER "Rapiduction" LATHES

THE OSTER MANUFACTURING COMPANY • 2073 EAST 61ST STREET, CLEVELAND 3, OHIO, U. S. A.

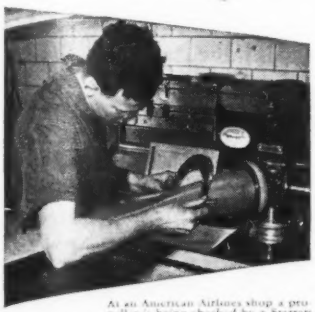


A Starrett "Mike" on the job at Consolidated Vultee Aircraft Corporation's Fort Worth Plant



Checking the angle on a cam-action form die with a Starrett Bevel Protractor at Curtiss-Wright, Buffalo

A Starrett Vernier Height Gage at Fairchild Aircraft Division of Fairchild Engine and Airplane Corp., Hagerstown, Md.



At an American Airlines shop a propeller is being checked by a Starrett Micrometer

where a *"Hair Off"* may mean a close shave . . . *you'll find* STARRETT TOOLS

Starrett Calipers in action at Douglas Aircraft Co.'s Santa Monica plant

Your work, too, has no doubt had to meet higher standards of precision and uniformity at the same time you've had to turn it out faster than ever.

Starrett Micrometers, Vernier Gages, Dial Indicators and other fine measuring tools lend skilled hands the added confidence and sureness that has meant both accuracy and speed. In the strenuous competitive days to come you will find it equally worth your while to ask your mill supply man for Starrett Tools.

Starrett Micrometers speed accuracy at Lockheed Aircraft Corp., Burbank, Cal.

Now, with 4 Service Stars

THE L. S. STARRETT CO. · ATHOL · MASSACHUSETTS · U. S. A.

World's Greatest Toolmakers

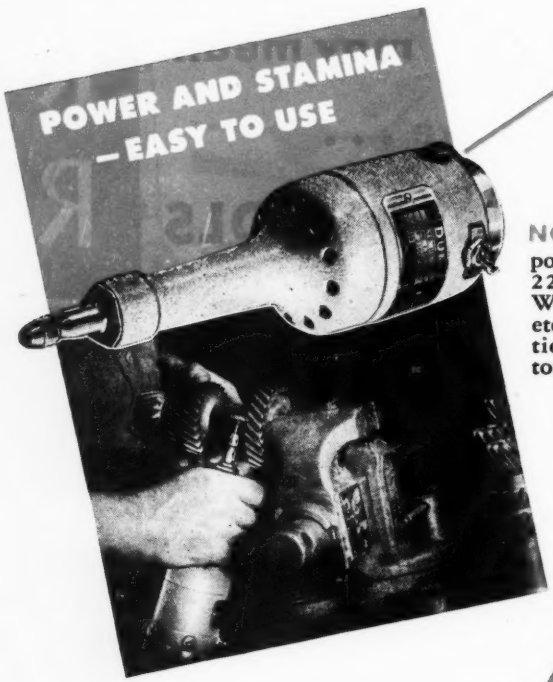
STARRETT

PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK
HACKSAWS • METAL CUTTING BAND SAWS • STEEL TAPES

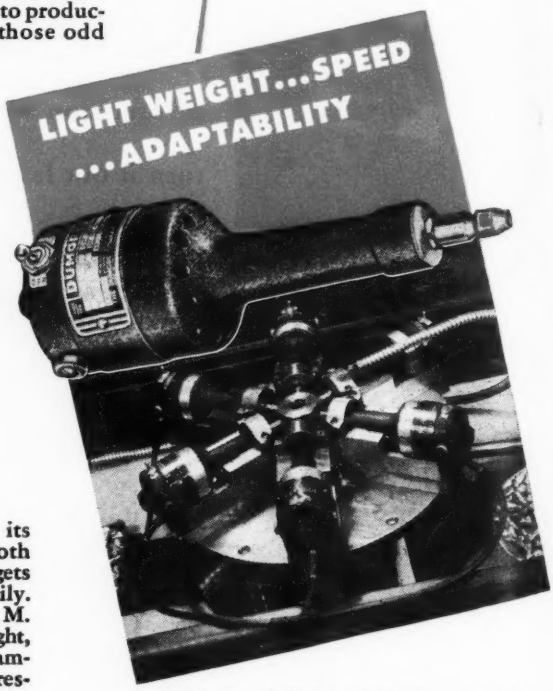
STARRETT TOOLS

WHAT DO YOU NEED IN A HAND GRINDER?

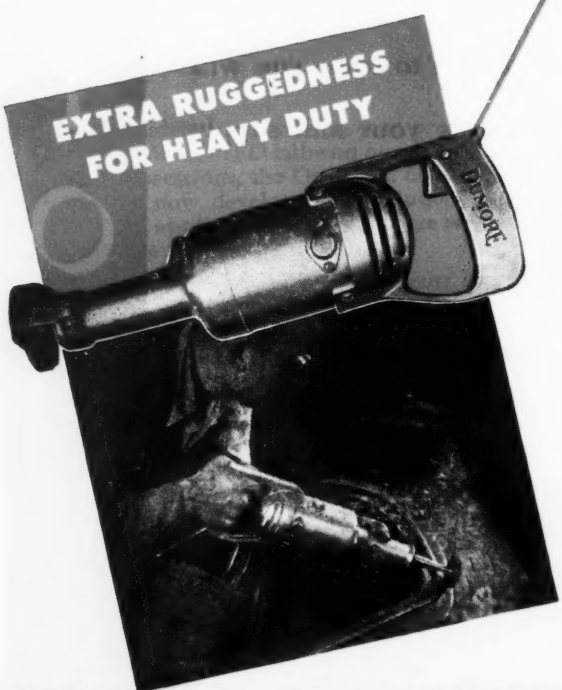
No matter which of these Dumore Hand Grinders you pick for your particular work, you'll find they all have these things in common: The outstanding Dumore construction features of compactness . . . light weight . . . power . . . high speed . . . endurance . . . and precision. For full details on all Dumore Hand Grinders, request Catalog 42. The Dumore Company, Tool Division, Dept. TK-28, Racine, Wisconsin. (Eastern Sales and Service Branch, 13 East 40th Street, New York 16, N. Y.)



NO. 10— A tool with *double* the power of the average grinder. Speed, 22,000 R. P. M. Length, $9\frac{13}{16}$". Weight, 2 lbs. 15 ozs. Wheel diameters, $\frac{1}{8}$" to $\frac{7}{8}$". A boon to production—a necessity for those odd touch up jobs.



NO. 8— A lightweight, but *precision-built* throughout. Speed, 18,000 R. P. M. Length, $8\frac{1}{2}$". Weight, 2 lbs. 6 oz. Wheel diameters, $\frac{1}{8}$" to $\frac{7}{8}$". A veteran at odd jobs and production.



NO. 9—With all its husky power, a smooth operating tool that gets into tight places easily. Speed, 15,500 R. P. M. Length, $15\frac{9}{16}$". Weight, $7\frac{1}{2}$ lbs. Wheel diameters, $\frac{1}{8}$" to $2\frac{1}{2}$" (resinoid).

DUMORE

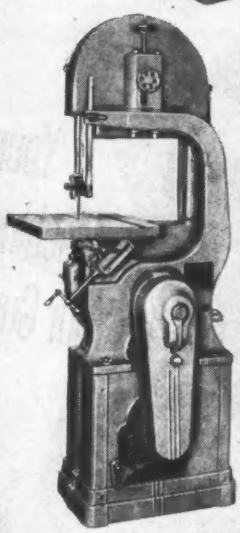
PRECISION AND HAND GRINDERS

Sold by Authorized Industrial Distributors in All Principal Cities

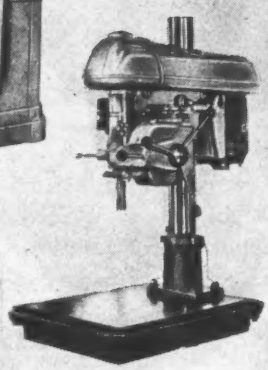
Walker-Turner

MACHINE TOOLS' WIDE SPEED RANGES CUT MACHINING COSTS!

RADIAL DRILL
16 Speeds from
160 to 5300 R.P.M



BAND SAW
8 speeds from
61 to 5300 S.F.M.



20" DRILL PRESS
5 speeds from
280 to 5200 R.P.M.

● Using the *correct* cutting speed for every operation and material pays off in faster machining—fewer damaged tools and blades —cleaner, more accurate production. This all adds up to *lower cost per piece!*

Exceptionally wide speed ranges with ample adjustments between "high" and "low" enable Walker-Turner Machine Tools to cut costs substantially. The Radial Drill's jack-shaft assembly and the Band Saw's back-gearing and cone-pulley arrangement are examples of this advanced designing. Write today for detailed catalog.

WALKER-TURNER COMPANY, INC.
PLAINFIELD, N. J.

MORE FOR YOUR MACHINE-DOLLAR
with prices like these!

RADIAL DRILL—$352.50 less base and motor.
14" BAND SAW—$127.50 less base and motor.
20" DRILL PRESS—$255.00 less motor.
(Slightly higher west of Rockies and in Canada).

walker-turner
COMPANY, INC.
PLAINFIELD, N.J.
U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

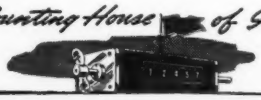
Why don't you get together on proof that you both can count on?

Confidential note to machine-builders and manufacturers of mechanical products (with a couple of side remarks to users):—

It's as simple as this: Build into your machine or product, as an integral part, a Veeder-Root Counting Device that registers strokes, turns, pieces, trips, and many other units of performance . . . mechanically or electrically. Then your customers can *see* when your guarantee period is reached . . . for the Facts-in-Figures are right there in front of them in plain, bold black and white. So there's no room for argument, no needless loss of goodwill or future business through lack of positive proof.

There are Veeder-Root Devices that will record the exact number of performance-units constituting the guarantee period. And then these devices will go on proving to your customers that they're getting all the performance you built into your product. You are invited to take "*Count*sel" with Veeder-Root engineers, who will show you just how you can protect and profit yourself with built-in Veeder-Root *Count*rol.

The Counting House of Industry



VEEDER-ROOT INC.

Hartford 2, Connecticut

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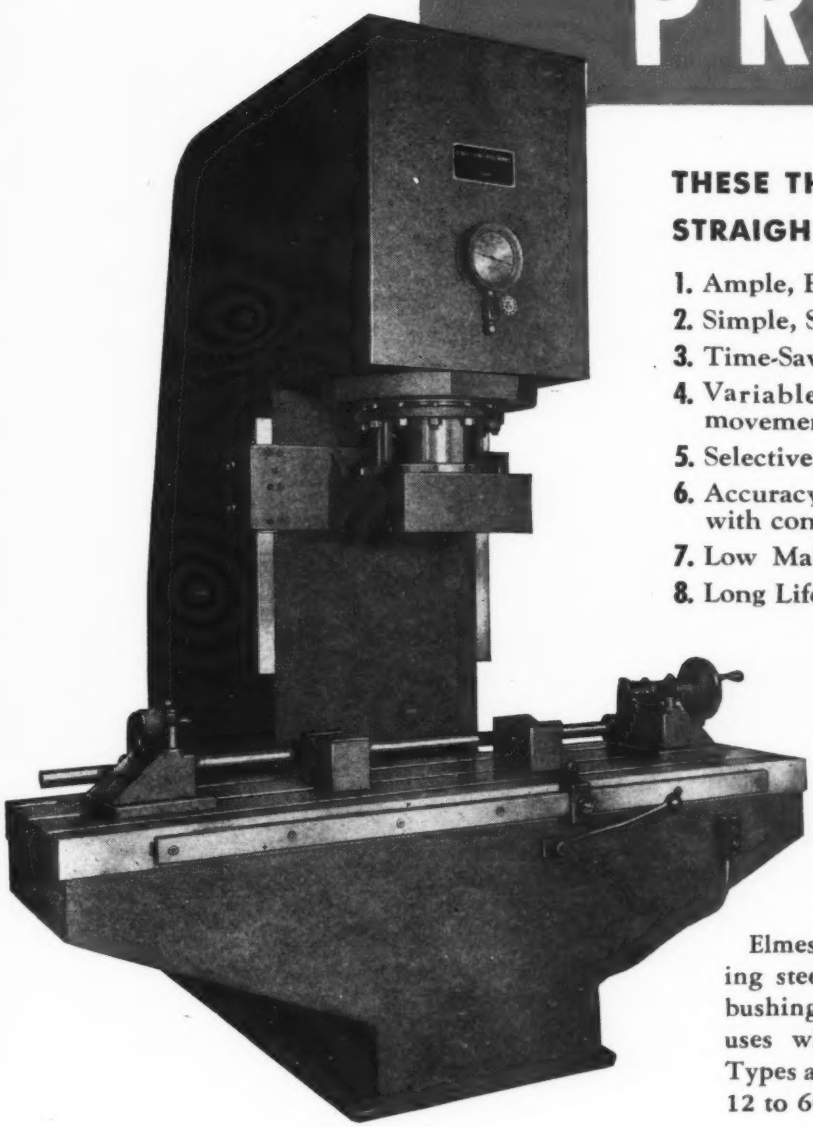
OPEN SIDE PRESSES

Proportionate Control for Accuracy with Speed



Model 6430 Elmes 150-ton open side press, shown with shaft-straightening fixtures. Bed: 96″ x 24″. Platen: 17″ x 18″. Opening: 32″. Maximum Stroke (adjustable): 20″. Speeds, in inches per minute: Advance, 75; Pressing, 12; Return, 150. A rugged, welded steel frame, self-contained unit suitable for many purposes. Other types include power-traveled table designs for very heavy pieces.

THESE THINGS YOU WANT IN STRAIGHTENING PRESSES . . .

1. Ample, Responsive Power.
2. Simple, Sensitive Control.
3. Time-Saving Rapid Traverse to and from piece.
4. Variable Slide Travel, to eliminate needless movement.
5. Selective Pressures, to suit the job.
6. Accuracy, for consistently good work—for speed with confidence.
7. Low Maintenance, for uninterrupted operation.
8. Long Life, for years of useful service.

Elmes open side presses give you all this, and *more!* Hydraulic pressure is an irresistible force which Elmes simplified control makes fast, accurate, *instantly responsive.* Nearly a century of specialization has developed Elmes craftsmanship—built the Elmes reputation for *dependability*—produced the equipment which set such *outstanding records* in war production.

Elmes open side presses are *ideal* for straightening steel castings, shafting, forgings—for forcing bushings in or out—and for a *thousand* different uses wherever controllable pressure is needed. Types and sizes for every service, in capacities from 12 to 600 tons, and larger. Write, *today!*

ELMES HYDRAULIC EQUIPMENT

ELMES ENGINEERING WORKS OF AMERICAN STEEL FOUNDRIES • 222 N. Morgan St., Chicago 7, Ill.
Also Manufactured in Canada

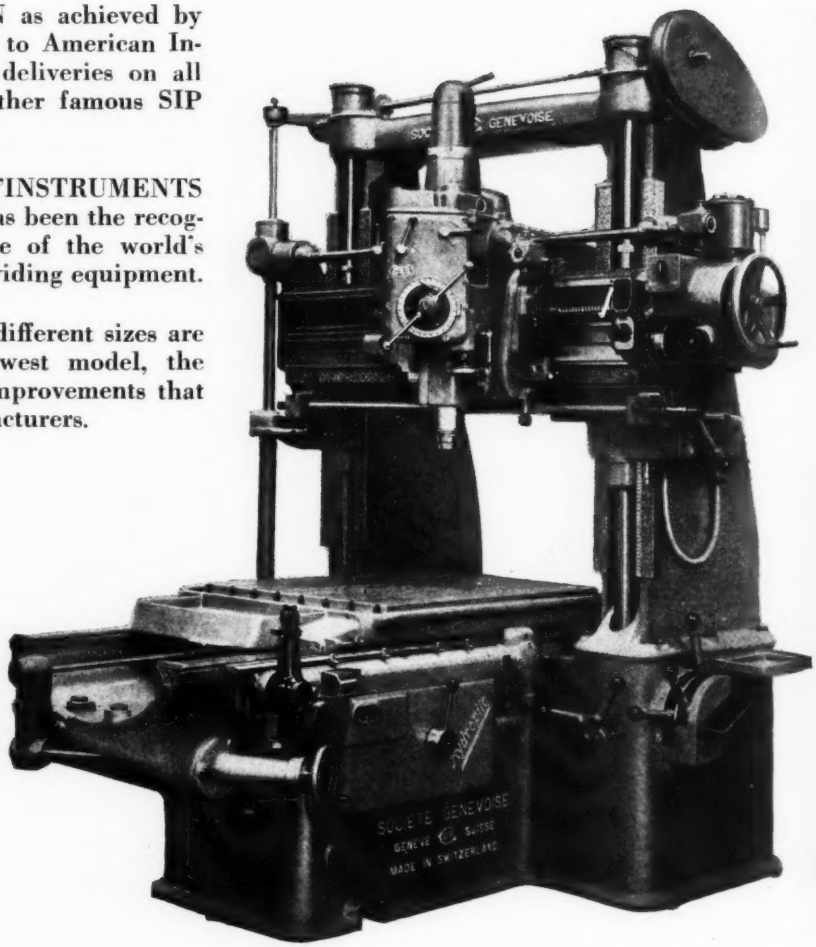
METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES

HIGH PRECISION

HIGH PRECISION as achieved by SIP is again available to American Industry with excellent deliveries on all size Jig Borers and other famous SIP equipment.

Since 1862 SOCIÉTÉ GENEVOISE D'INSTRUMENTS DE PHYSIQUE of Geneva, Switzerland, has been the recognized leader in the manufacture of some of the world's most accurate machines, measuring and dividing equipment.

Over two thousand SIP Jig Borers of different sizes are in use all over the world and the newest model, the HYDROPTIC-B, here shown, embodies improvements that are greatly desired by progressive manufacturers.



THE HYDROPTIC–B

- Performs MILLING AS WELL AS BORING with an equal degree of precision.
- Maintains PERMANENCE OF ACCURACY in spite of heavy mechanical stresses and strains.
- Gives HIGH EFFICIENCY over a large range of speeds and feeds.
- Performs every operation through automatic movements and convenient location of controls.
- Can be used as a measuring instrument.

The HYDROPTIC-B has no lead screws but is equipped with an optical measuring system which consists of a standard scale and microscope of extreme precision whose accuracy is unquestioned.

This Jig Borer and Milling Machine is equipped with a hydraulic table drive which permits rapid traverse of the table over its full stroke in one half minute.

While the machine is working, advance settings can be made for the next operation thus effecting great savings in time.

The table working surface is 39½"x32". A guaranteed accuracy for all settings of work table and spindle head of .0002".

Consult with us for complete information regarding SIP High Precision Equipment.
Catalogs furnished upon request.

We also represent in the United States other world famous Swiss High Precision Equipment.

ANDRE BECHLER • MAAG GEAR WHEEL COMPANY • MIKRON • SAFAG • STUDER
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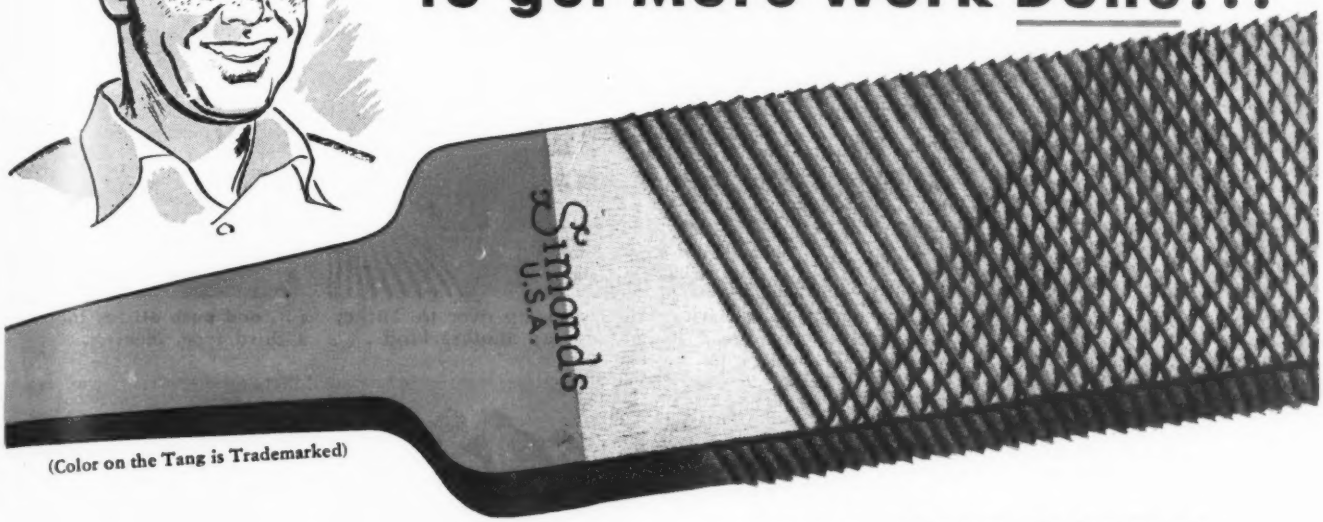
IMMEDIATE DELIVERY from stock in New York on some machines.

HIGH PRECISION MACHINE TOOLS COSA **AND MEASURING INSTRUMENTS**

COSA CORPORATION CHRYSLER BUILDING NEW YORK CITY 17, N. Y.

"Takes me a Lot Less Work to get More Work Done..."



(Color on the Tang is Trademarked)

Special *Red Tang* Long-Angle Lathe File removes stock quickly and smoothly, without clogging.

...with SIMONDS RED-TANG FILES"

Workers like *Red Tang* Files because they can remove more stock with less elbow-grease. And management likes them because they stay sharp and last longer, giving more "file-mileage" per dollar. *Red Tang* Files cut (instead of scrape) with teeth designed like the teeth of a Simonds metal-cutting saw . . . curl up long, even chips.

Made under ideal conditions in the world's first windowless plant, Simonds *Red Tang* Files come in only one quality . . . the highest standard to which *any* file can be made. So next time you need standard files, tell your dealer specifically to send you Simonds *Red Tang. Then measure the extra value you get.*

Branch Offices: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. 8th St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Avenue, Portland 4, Ore.; 31 W. Trent Avenue, Spokane 8, Wash.

PRODUCTION TOOLS
FOR CUTTING METAL,
WOOD,
PAPER, PLASTICS

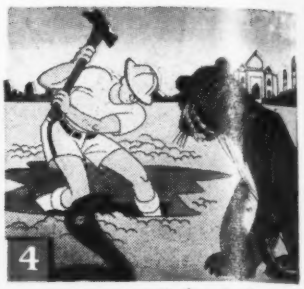
SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASSACHUSETTS

What will they cook up next?

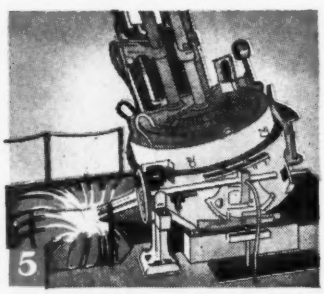
You make alloys by "cooking" several metals together.

For example, you go to Africa and dig up some rare ore.

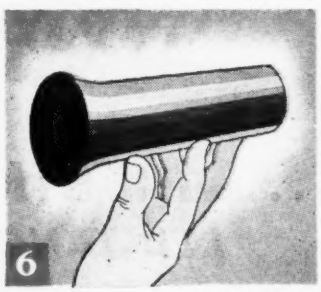
Then, you zip over to Turkey and dig up another kind . . .



. . . and push off for India for a third type. Next . . .

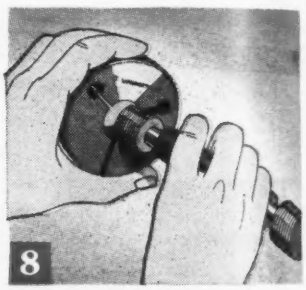


. . . you mix 'em exactly right and cook 'em in an electric furnace.

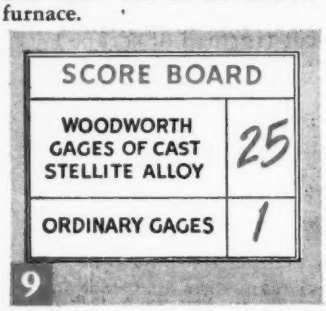


What have you got? STELLITE! A wonderful, useful new alloy.

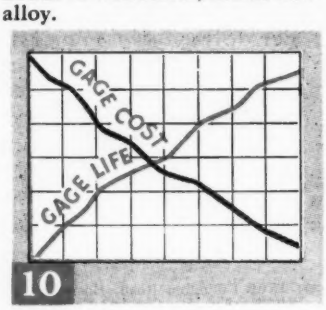
N. A. Woodworth and Stellite engineers put their heads together.



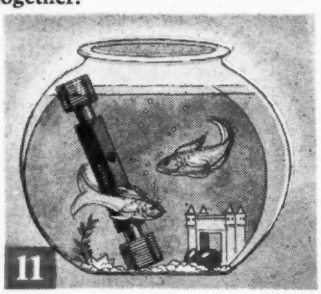
Result! Long-wearing and corrosion-resistant GAGES.



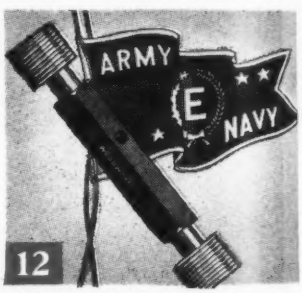
Woodworth Gages of Stellite Cast Alloy *outwear steel 25 to 1.*



They increase gage life many times—reduce gaging costs.



And, *they won't rust or corrode,* in storage or in use.



Woodworth Gages made with Stellite set production records!

What Woodworth research means to industry

PIONEERING in the use of splendid new materials like Stellite is almost an everyday occurrence at Woodworth.

Here's why.

Every Woodworth product must conform to this basic research and manufacturing policy . . . *to make only products which will benefit industry through increased production and reduced costs.*

Since Stellite makes certain Woodworth products more efficient, it is being used. But, if tools and gages made out of *fragments of the moon* were required to speed up production and lower costs, our engineers would strive to find a way to furnish them.

Our always-try-to-make-it-better attitude should be of real help to industries preparing for the coming scramble for post-war markets.

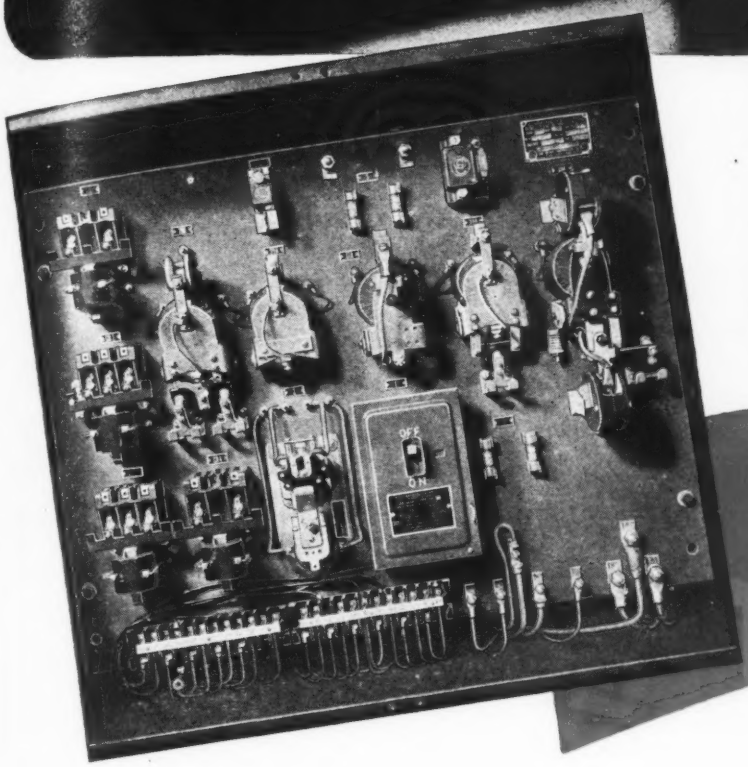
ACCURACY YOU W CAN TRUST

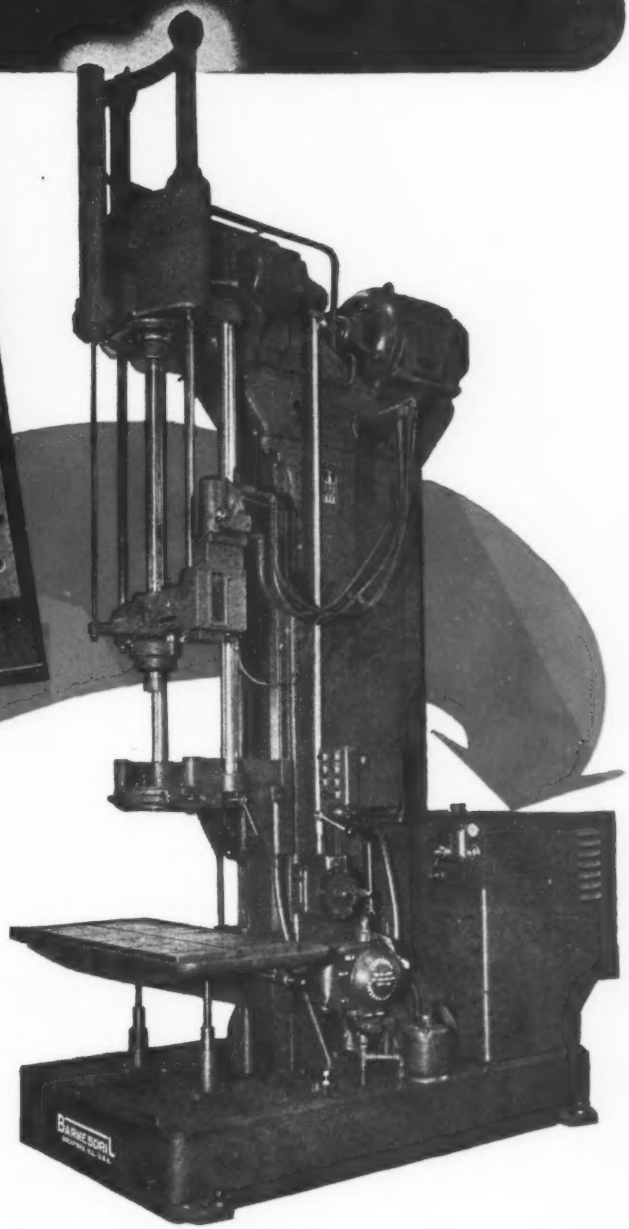
WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MI[illegible] ROAD
DETROIT 20, MICHIGAN

PRECISION GAGES
PRECISION MACHINED PARTS
PRECISION TOOLS

"3C" CONTROL SIMPLIFIES INTRICATE OPERATIONS ON BARNESDRIL HONING MACHINE





A simple push-button station mounted on the front of the machine, within easy reach of the operator, controls all operations on the **BARNESDRIL** No. 4014 Hydraulic Honing Machine.

"3C" Direct Current Control panel illustrated is built into a compartment in the rear of the base, making a unit type machine. Besides controlling the drive motors—10 H. P. with reduced voltage starting for the hydraulic unit, 20 H. P. with dynamic braking for the spindle and ¾ H. P. for the coolant pump, the panel provides control relays to energize the Controlled Hone Expansion, Reciprocation and Withdraw Solenoids, and a Time Relay to allow the hone to cut free after maximum expansion before it energizes the solenoid for withdrawing the hone from the work.

This type of machine has been an important factor in speeding the production of vital Diesel Engine and Aircraft parts.

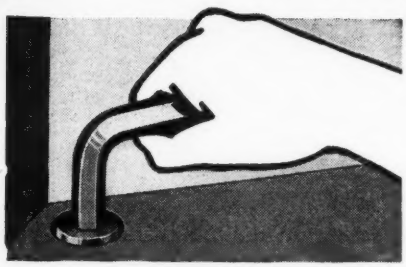
Clark specializes in controls for modern, high speed machine tools. Let Clark engineers help you design the proper controls for your equipment.

THE CLARK CONTROLLER CO.

1146 EAST 152nd ST., CLEVELAND 10, OHIO • EVERYTHING UNDER CONTROL

HOLO-KROME *fibro forged* SOCKET SCREWS

. . INTERNAL WRENCHING



QUICK AND POSITIVE

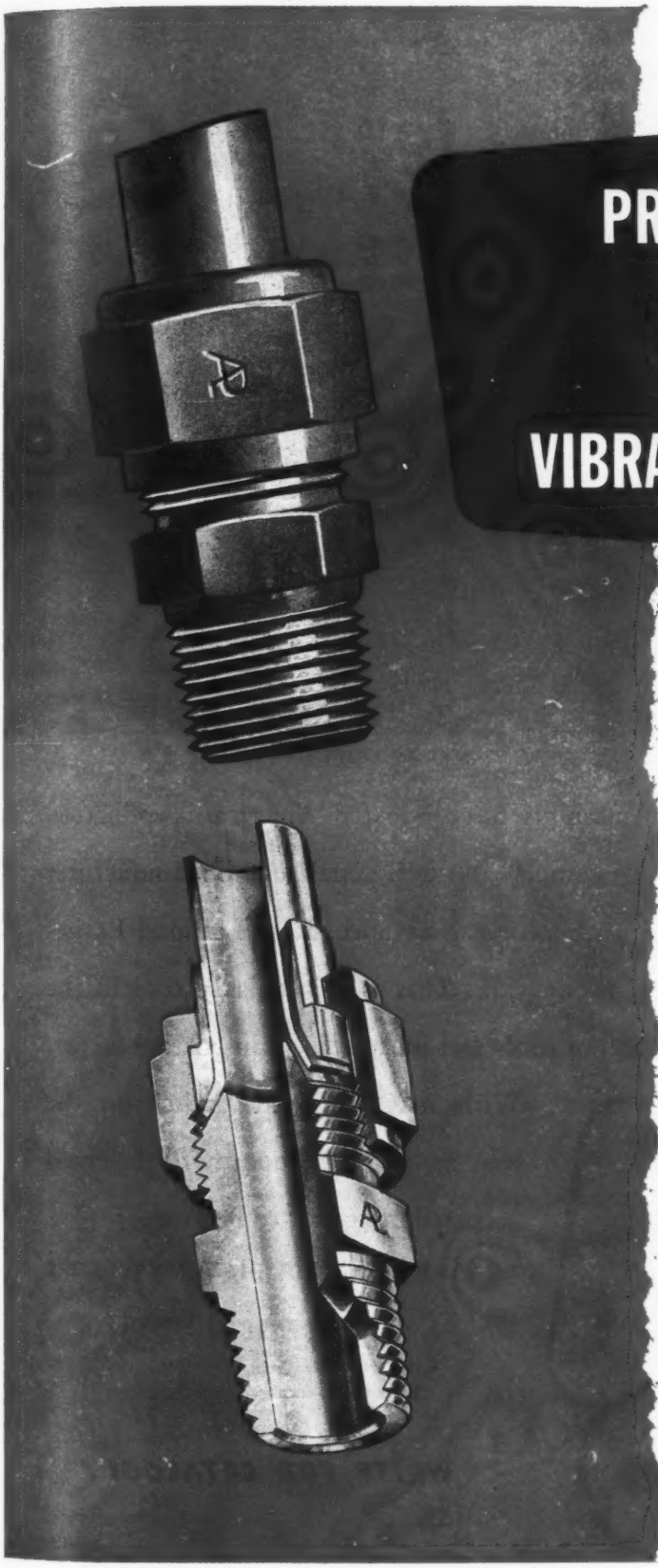
THE *BETTER* FASTENING METHOD

Industry is taking advantage of its war-time experience in the use of Holo-Krome Socket Screw products, by incorporating them in the design and the redesign of its peace-time products. . . . New applications for Holo-Krome FIBRO FORGED Screws — the Completely Cold Forged Screws — are increasing daily. . . . Unfailing performance is the Holo-Krome guarantee. . . . Save weight, space and assembly time, specify "Holo-Krome." *The Holo-Krome Distributor is ready to serve you.*

The **HOLO-KROME SCREW CORPORATION**

Main Offices & Plant

HARTFORD 10, CONN., U. S. A.



PRESSURE-TIGHT
LEAK-PROOF
VIBRATION-PROTECTED

The Parker Triple Type Fitting proved itself so efficient and economical that its principle was standardized for Army-Navy use on aircraft and ordnance.

The flared joint of this fitting provides maximum "tightness" without strain or tension on the tubing itself. It is fully protected against leakage under pressure, and is safe in conditions of extreme shock and vibration.

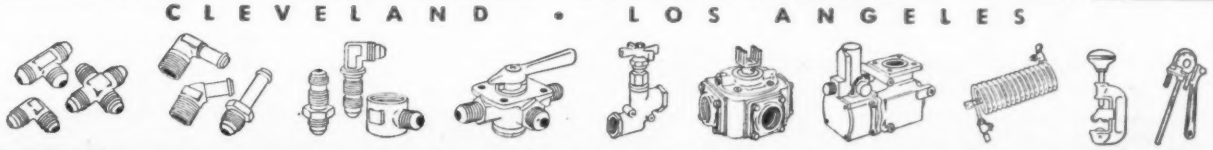
Parker systems provide streamlined flow, free from obstructions, and are easy to install and service, even in hard-to-get-at spots.

Production released by reduced military needs now permits you to use Parker fittings, in a wide variety of types, sizes and capacities, for power and fluid transmission systems.

Immediate deliveries from Parker warehouses, or from your mill supply house. Information gladly furnished by Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio.

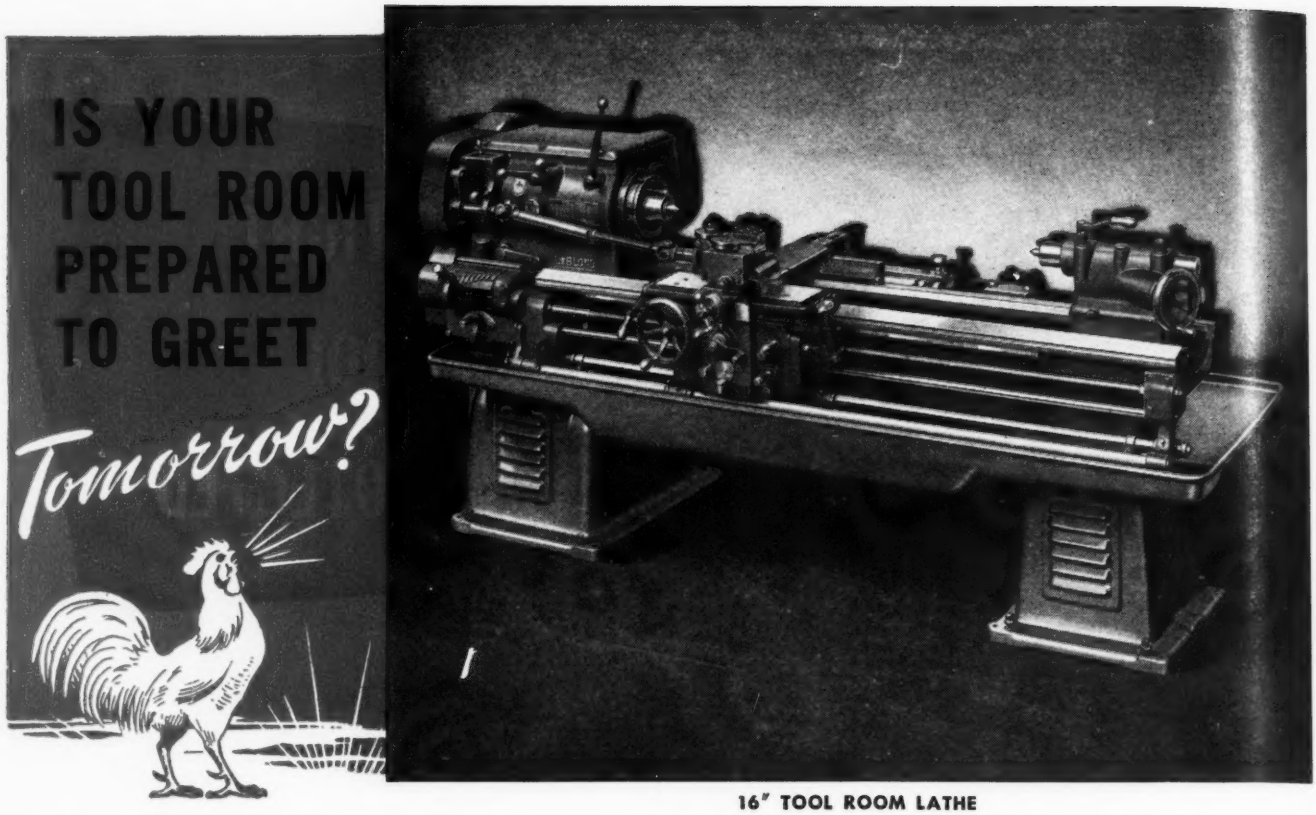
THE PARKER APPLIANCE CO.

CLEVELAND • LOS ANGELES



FLUID POWER PRODUCTS FOR ALL INDUSTRY

IS YOUR TOOL ROOM PREPARED TO GREET *Tomorrow?*



16" TOOL ROOM LATHE

New and better machines, equipment and methods have boosted American production to an all time high. In the days to come, keen competition will penalize the manufacturer who fails to keep pace with this continuing technological advance. New LeBlond Lathes will help you keep abreast of the march of production. This is particularly true in the tool room where accurate, low-cost production of tools and fixtures is an important factor.

With new LeBlond Lathes on the job, your tool room will be well prepared to greet tomorrow.

AVAILABLE IN 12", 14", 16" AND 18" SIZES

LEBLOND FIELD ENGINEERS ARE AT YOUR SERVICE to help you in your development work, particularly along the lines of the difficult, the "out-of-the-ordinary" turning problems. The accumulated knowledge of every manufacturing trend in good times and bad—peace and war—gained over a period of nearly 60 years from thousands of installations all over the world, is yours for the asking. Contact our nearest dealer or write Dept. FE 46.

SINCE 1887

the world has been turning to LeBlond for turning equipment.

★

WRITE FOR CATALOG!

THE R. K. **Le BLOND**

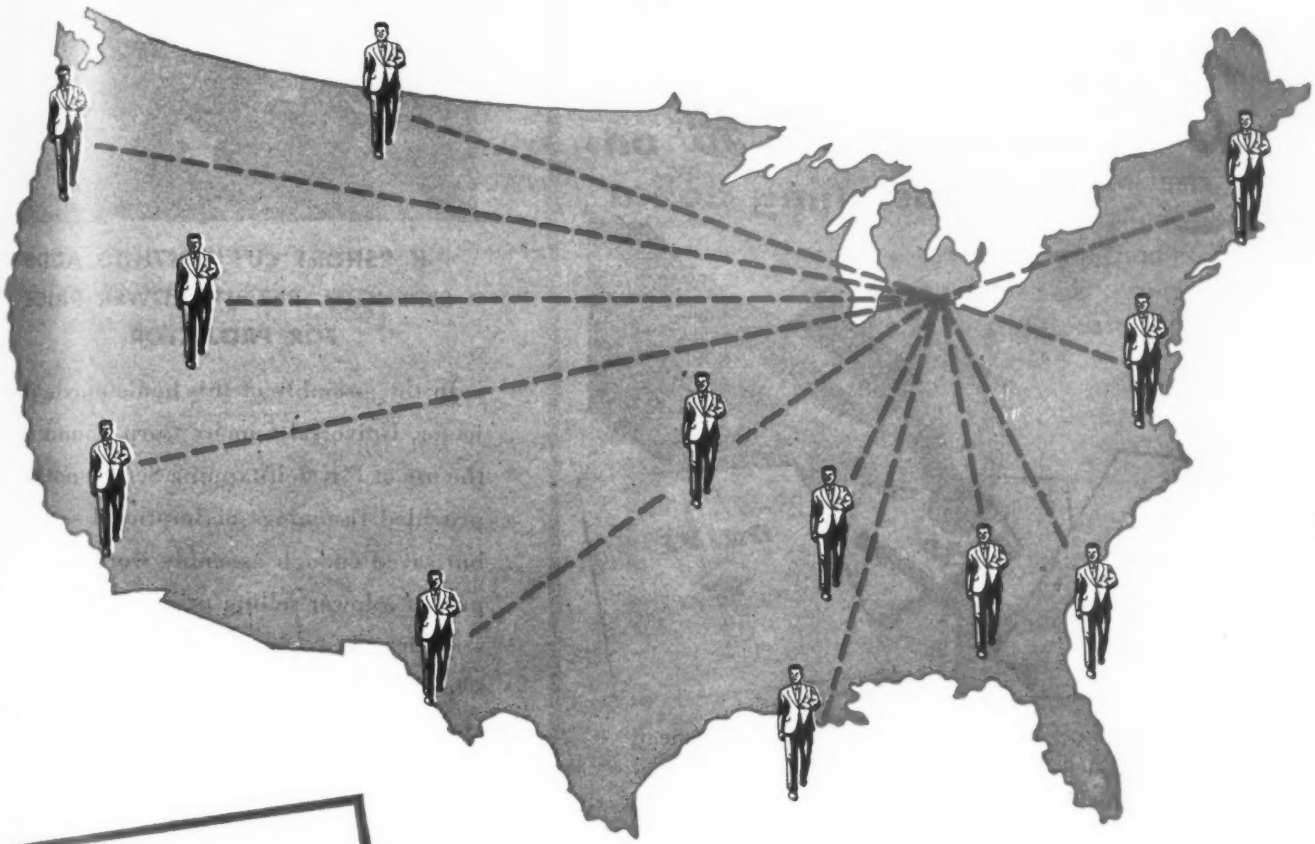
ARMY-E-NAVY **KEEP BUYING BONDS AND KEEP THEM**

MACHINE TOOL CO., CINCINNATI 8, OHIO, U. S. A.

NEW YORK 6, Singer Bldg., 149 Broadway, WOrth 2-0722
CHICAGO 6, 20 North Wacker Drive, STA 5561

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

A NATIONAL Engineer is Nearby to Serve You!



Call Your DISTRIBUTOR!

Leading distributors in every section of the country have complete stocks of National Cutting Tools. Call your Mill Supply Distributor for National Cutting Tools or any staple industrial product.

NATIONAL SERVICE ENGINEERS are strategically located in every section of the country. These highly-trained specialists have had years of experience in dealing with all types of problems concerning cutting tools and their uses.

Their counsel and assistance are at your disposal. Just call the National distributor in your locality.

NATIONAL

NATIONAL TWIST DRILL & TOOL © ROCHESTER, MICH., U.S.A.

TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
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SPECIAL TOOLS

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DETROIT AND ROCHESTER, MICHIGAN

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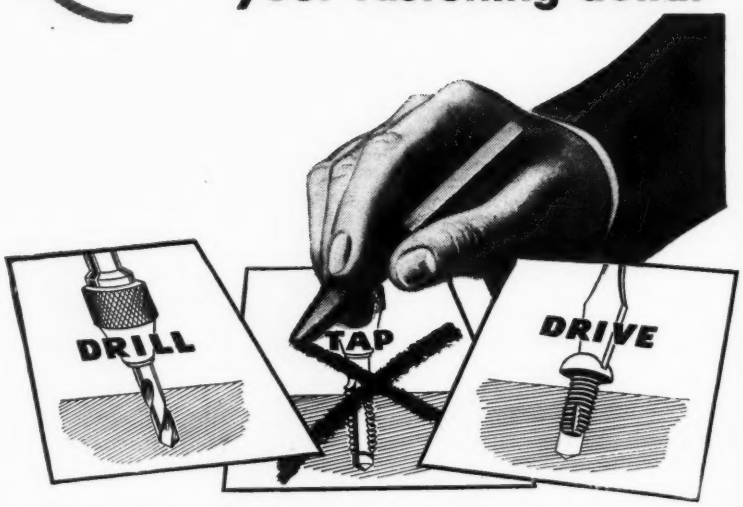
Factory Branches • New York • Chicago • Cleveland • San Francisco • Distributors in Principal Cities

TAKE THIS

Short Cut to Better Assemblies

... and save up to 50¢ on your fastening dollar



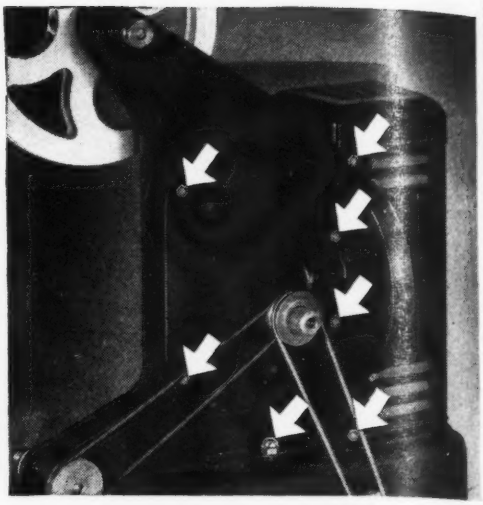
A FASTENING OPERATION BECOMES SIMPLY "DRILL-DRIVE", instead of drill-tap-drive, when you change over to P-K Self-tapping Screws. You eliminate tapping for machine screws . . . end fumbling with bolts and nuts . . . avoid troublesome inserts in plastics, and do away with riveting in hard-to-reach places.

BESIDES SAVING YOU FROM 30% to 50% in fastening time and labor, the P-K "shortcut" method turns out a stronger assembly, because the extruded threads that are formed as P-K Screws are driven hold securely, and resist the severest vibration.

YOU CAN CHANGE to P-K Self-tapping Screws over night. No special equipment or special training of help is needed, although the "short cut" method often permits the use of power, in place of hand drivers.

CALL IN A P-K ASSEMBLY ENGINEER. He'll help you find all opportunities for saving time and money, and improving your product, with P-K Screws. Or, mail assembly details direct for recommendations. Parker-Kalon Corporation, 202 Varick Street, New York 14, N. Y.

SOLD ONLY THROUGH ACCREDITED DISTRIBUTORS



P-K "SHORT CUT" METHOD ADDS STRENGTH, PERMITS LOWER PRICE FOR PROJECTOR

In the assembly of this home movie projector, Universal Camera Corp. found that the use of P-K Self-tapping Screws not only provided fastenings of improved security, but saved enough assembly work hours to permit a lower selling price. Eight sub-assemblies are made of light metal parts fastened to die castings with the use of 23 P-K Hex Head Self-tapping Cap Screws and Type "U" Hardened Metallic Drive Screws.

"HOW TO USE" BOOKLET – FREE on request – will give you quick facts on all the P-K Self-tapping Screws and other Fastening Devices . . . tell you where and how to use them. Write for a copy . . . ask for Form 480.

PARKER-KALON
Quality-Controlled
SELF-TAPPING SCREWS

For Every Metal and Plastic Assembly

Specify *Van Keuren*

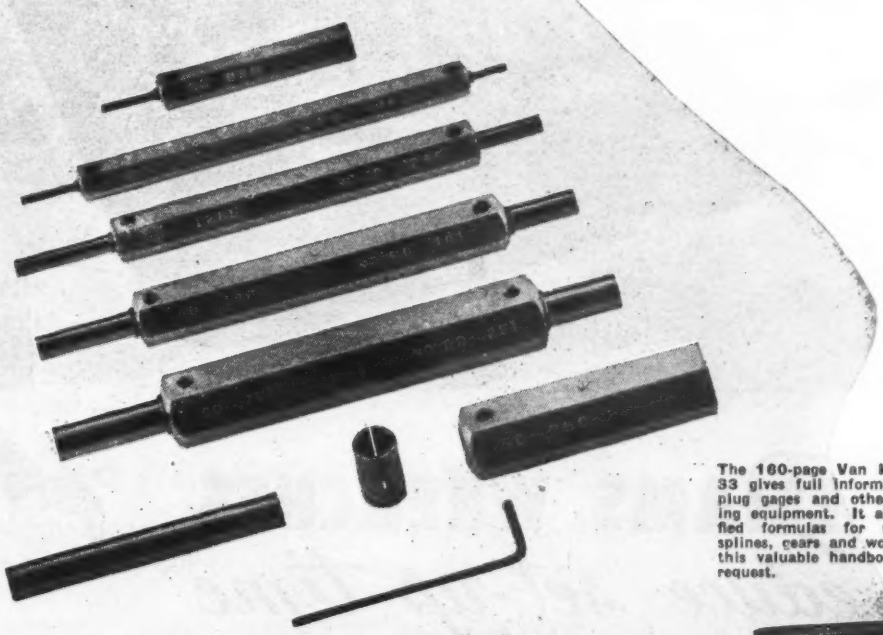
WIRE TYPE PLUG GAGES

. . . for gaging small holes

Wire type plug gages were originated by The Van Keuren Co. in 1925. They are now in almost universal use for gaging small holes.

Longer lasting precision and lower gage cost is assured because the entire 2" length of the gaging unit can be used. When the end becomes worn, it is ground off and a new section of the original accuracy is moved out for use. The wire unit is securely held in the handle by a split bushing and a headless set screw.

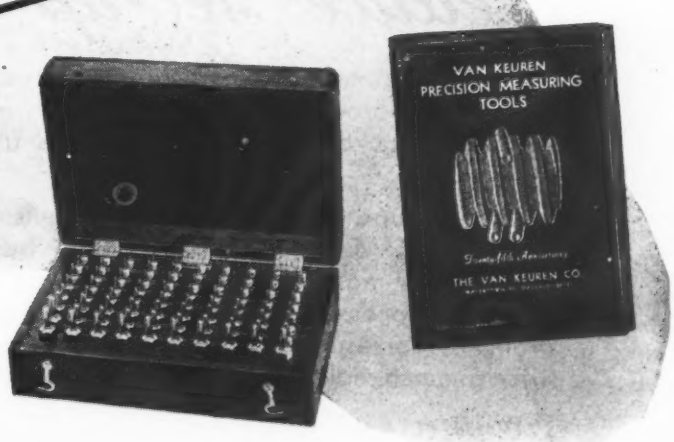
Van Keuren wire type gages are made to Class B accuracy, $+.00005'' \atop -.00000''$ on the Go units and $\pm.000025''$ on the No Go units. Closer or wider tolerances can be supplied if desired. Hard chromium-plated gaging units for use where the requirements are severe can be furnished at a slight additional cost.



Wire Type Plug Gage Set No. 60. This set of gages provides accurate standards for checking twist drills in sizes from 1 to 60 (.228" to .040" diameter). A useful set of standard size gages. Price—$875.00.

Van Keuren Wire Type Plug Gage Set No. 80 which includes drill sizes from No. 1 to 80 (.228" to .0135"). Price —$425.00.

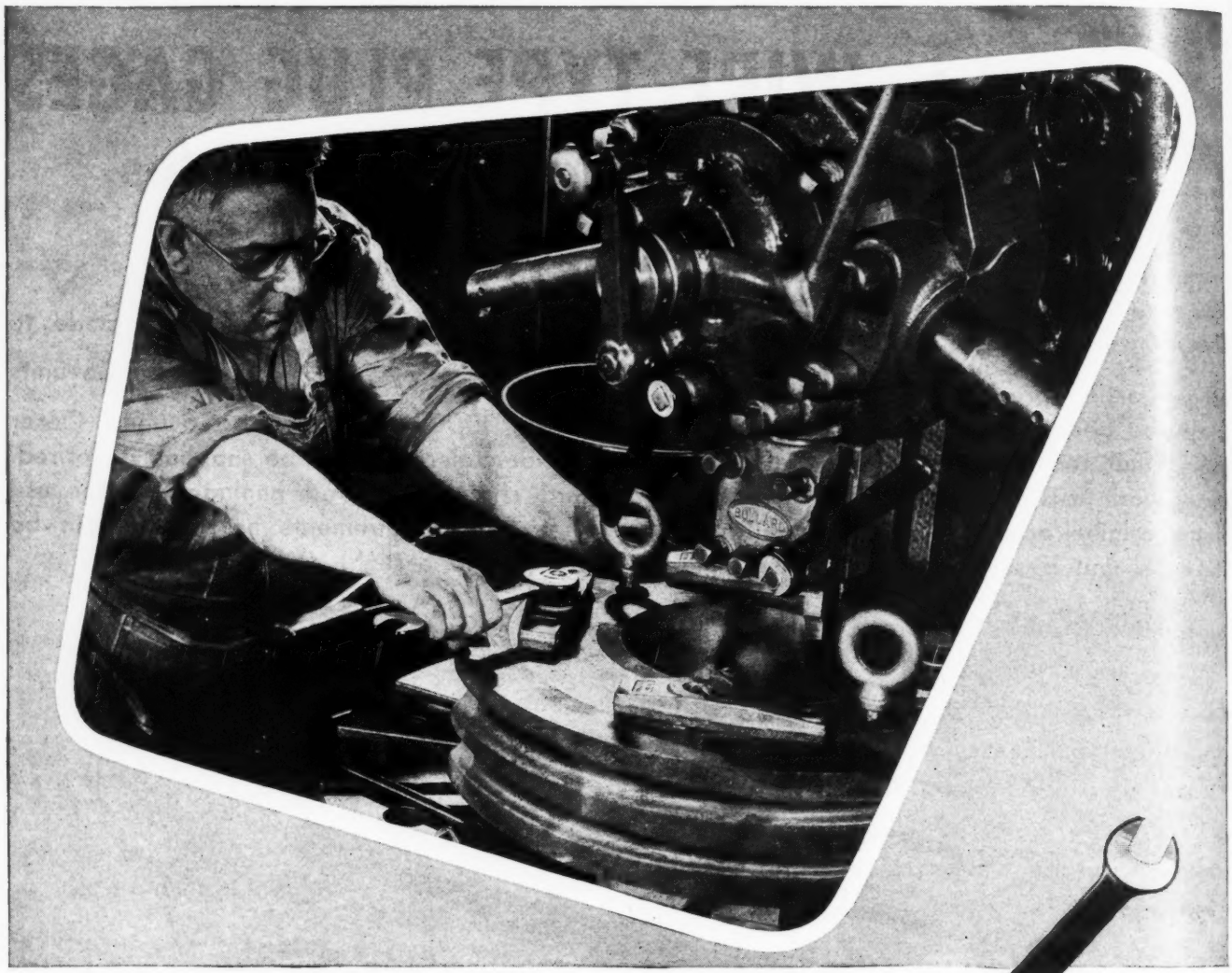
The 160-page Van Keuren Catalog No. 33 gives full information on wire type plug gages and other precision measuring equipment. It also includes simplified formulas for measuring threads, splines, gears and worms. Your copy of this valuable handbook will be sent on request.



THE *Van Keuren* CO., 178 WALTHAM ST., WATERTOWN, MASS.

25th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles



WILLIAMS WRENCHES
Reduce set-up time

Machine tools make money only when producing. Set-up time is non-productive, but it can be minimized by having *enough* of the *proper* wrenches at hand when setting-up.

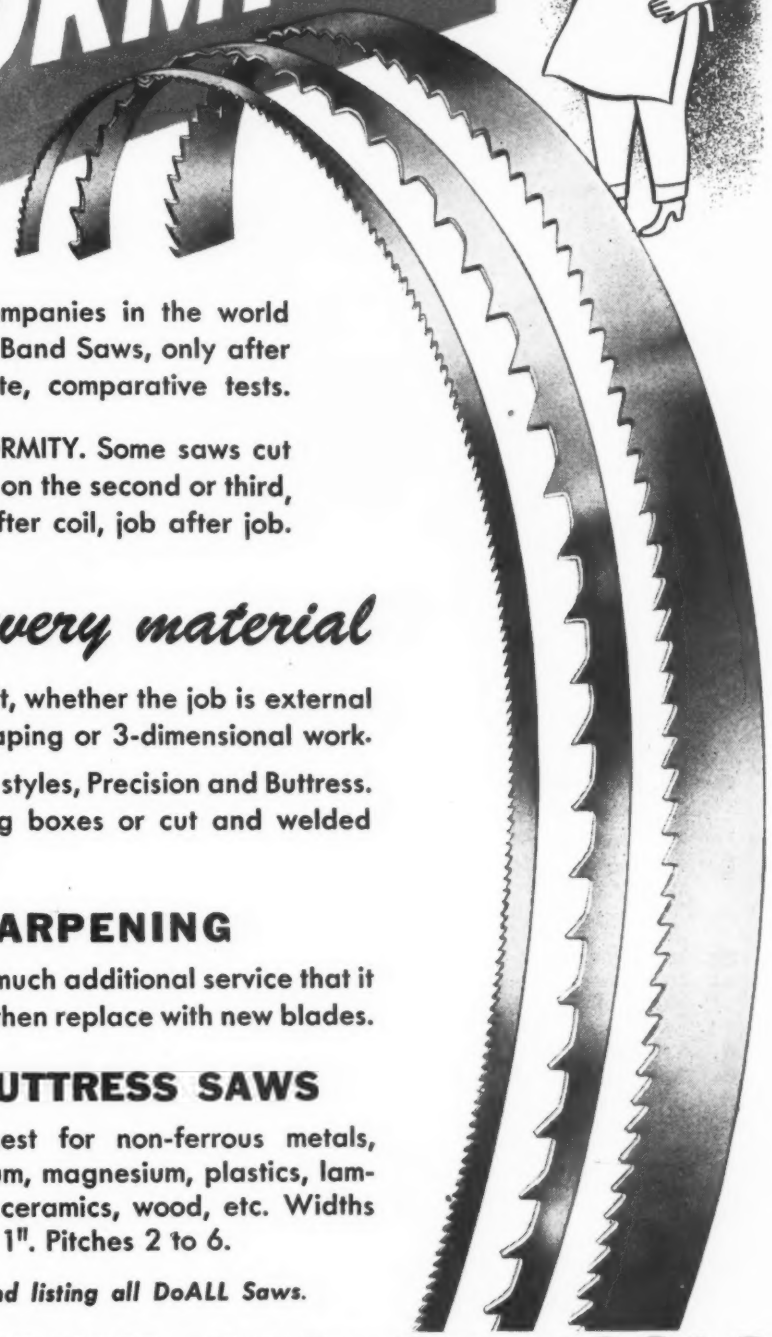
Williams "Superior" Carbon Steel Wrenches—made in 50 patterns, over 1000 sizes—have been industry's standby for more than half a century. Forged from specially-processed carbon steel, they average 93% as strong as corresponding alloy wrenches costing almost twice as much. Sold by Industrial Distributors everywhere.

J. H. WILLIAMS & CO., BUFFALO 7, NEW YORK

WILLIAMS

DROP-FORGINGS AND DROP-FORGED TOOLS

WINS ON UNIFORMITY



Recently one of the largest steel companies in the world (name on request) switched to DoALL Band Saws, only after making 29 very minute and concrete, comparative tests.

DoALL won on the basis of UNIFORMITY. Some saws cut faster on the first coil, then fell behind on the second or third, but DoALLs were most uniform, coil after coil, job after job.

A perfect saw for every material

You name it—there's a best DoALL saw for it, whether the job is external or internal cutting, straight line, contour shaping or 3-dimensional work.

DoALL Saws are available in two general styles, Precision and Buttress. Packed in 100-ft. coils in safety dispensing boxes or cut and welded to fit any band sawing or cut-off machine.

REQUIRE NO RESHARPENING

DoALL saw blades are so tough and give so much additional service that it is economical to run them until worn out and then replace with new blades.

PRECISION SAWS

Recommended for use on all ferrous metals. Come in widths from 3/32" to 1", pitches 6 to 32.

BUTTRESS SAWS

The finest for non-ferrous metals, aluminum, magnesium, plastics, laminates, ceramics, wood, etc. Widths 1/4" to 1". Pitches 2 to 6.

Write or phone for booklet illustrating and listing all DoALL Saws.

INDUSTRY'S NEW SET OF TOOLS

Contour Sawing

Band Filer

Surface Grinders

Magnetic Chucks and Selectron

Colloidal Oils

Dust Collector

Gage Blocks with Instruments

Baltimore	SA 5778	Dayton	NE 2738	Kansas City	HA 5857	Milwaukee	HO 5950	New York	MU 4-1514	Philadelphia	BAL 5850	Providence	WI 1515	Seattle	EAST 7500
Birmingham	3-0502	Denver	KE 7511	Los Angeles	TR 3871	Minneapolis	GL 1173	Orlando	6056	Pittsburgh	AT 3386	Reading	7258	Statesville	518
Boston	ASP 6669	Detroit	TE 2-3860									Rochester	MAIN 5175	Syracuse	3-7212
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Cincinnati	MAIN 3929	Hartford	6-7296									St. Paul	EN 2399	Tulsa	4-8841
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The DoALL Company — Des Plaines Illinois

Telephone Your "DoALL" Sales and Service Store

POSITIVE GAGING WITH ELGIN SAPPHIRE GAGES *is speeding our peacetime production*

You don't have to "baby" an Elgin Sapphire Gage. This one has been used more than a year and a half . . . gaging more than a million close-tolerance piece parts.

ELGIN Sapphire Dimensional Fidelity . . . Saves Man-hours . . . Materials . . . Money!

All too often, gage quality alone determines the difference between rejection or acceptance of satisfactory parts. That's why hundreds of manufacturers specify Elgin Sapphire Gages. The almost unbelievable dimensional fidelity of Elgin Gages is helping to improve and increase production, cut down costs and save waste. Get the facts!

Here are the answers to some questions you're sure to ask about Elgin Sapphire Gages:

Q. Why are manufacturers everywhere installing Elgin Gages?
A. They cut production costs. (Case history proofs gladly furnished.)

Q. Will Elgin Sapphire Gages burr?
A. No. They are not subject to burring as are steel gages. It is impossible to gage parts inaccurately as a result of unnoticed damage to the gage.

Q. Are they available in all sizes?
A. Yes. No "wear allowance" need be made.

Q. Will Sapphire "walk"?
A. No. Sapphire is not subject to phase changes affecting steel and other metals. It permanently maintains dimension. Elgin Sapphire requires no seasoning or aging . . . is chemically inert and inherently stable.

Investigate Elgin Sapphire for: GAGES • THREAD GUIDES • EXTRUSION DIES • KNIFE EDGES • SPRAY NOZZLES • SOFT WIRE DIES • BURNISHING TOOLS • PRESSURE VESSEL WINDOWS • HONING STONES

SAPPHIRE PRODUCTS DIVISION OF THE
ELGIN NATIONAL WATCH COMPANY
Aurora, Illinois, U. S. A.

*** ELGIN ***
Sapphire Gages
DIMENSIONAL FIDELITY IN GAGING OPERATIONS

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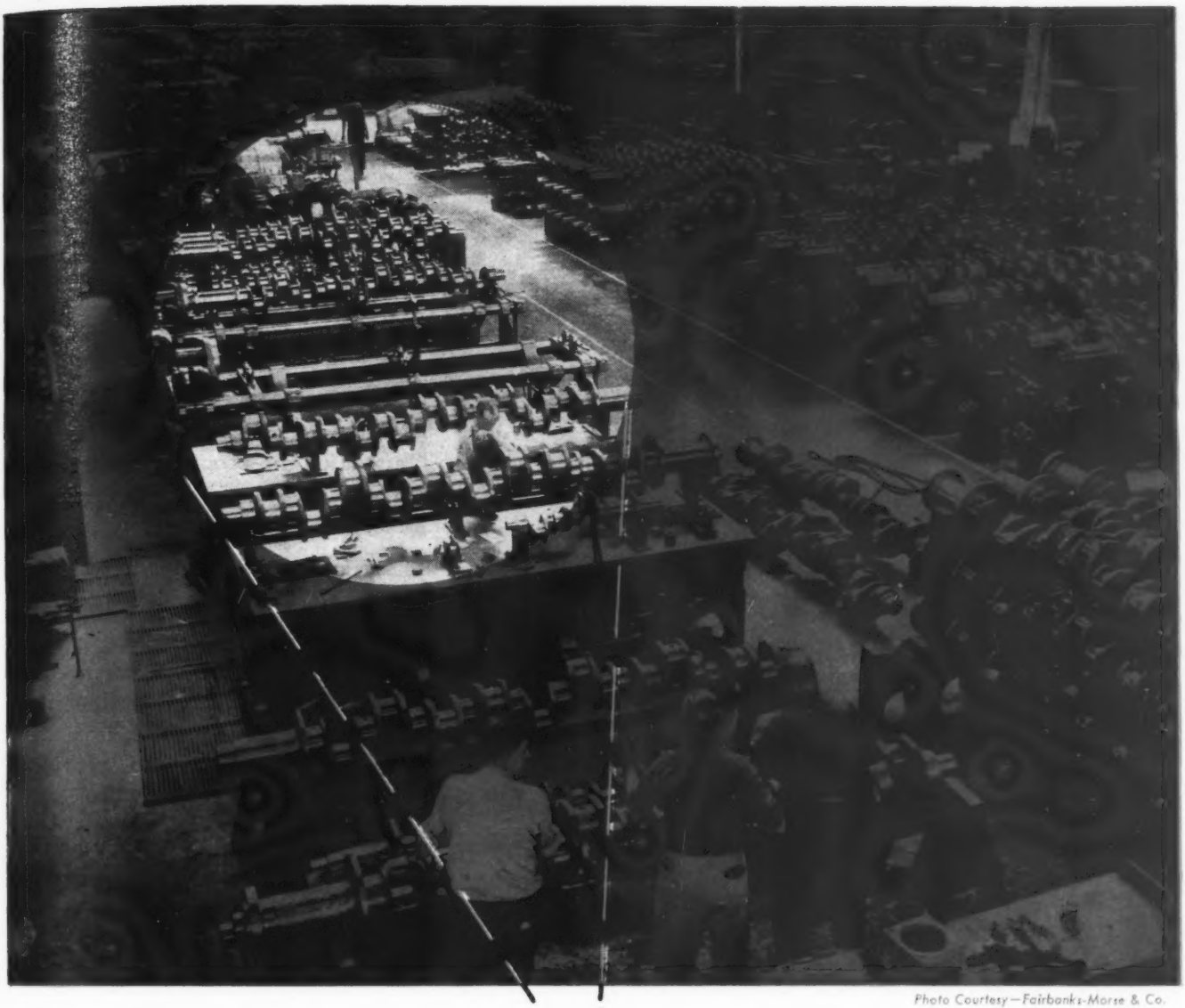

Photo Courtesy—Fairbanks-Morse & Co.

it's OLSEN for Balancing at Fairbanks-Morse . . .

Diesel engine crankshafts, produced at the Beloit plant of Fairbanks-Morse & Co. are balanced by Olsen Type "S" dual compensating balancing machines shown above.

Every shaft is dynamically balanced. The direct reading compensators indicate the angle and amount of unbalance in the planes in which corrections are to be made. The Olsen cradle type design permits multiple support to these lengthy shafts (up to 12 feet) thereby eliminating deflection difficulties.

The use of Olsen Balancing Machines has made it possible to effect substantial savings and increase production in this Fairbanks-Morse plant.

Olsen equipment reduces costs and improves products. Write today describing your problem.

TINIUS OLSEN TESTING MACHINE CO.
530 NORTH TWELFTH STREET, PHILADELPHIA 23, PA.
Balancing Machines AND PHYSICAL TESTING EQUIPMENT

Representatives: **PACIFIC SCIENTIFIC CO., Los Angeles, San Francisco, Seattle**
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THERE IS AN OLSEN BALANCING MACHINE TO BALANCE ANY ROTATING PART . . .
FROM MINIATURE MOTOR ROTORS TO PARTS WEIGHING UP TO 25,000 POUNDS

then he said to himself:

"Education Will Win"

OF all the heroic plans to raise the status of the people—simplest and most practical is that of Mexico's President Comacho. Says he—

"Each educated Mexican is to teach an illiterate Mexican to read and write."

The reason for this, he explains, is that we are going into a new world where education will win. Well he knows that the passing along of primary facts, from the instructed to the uninstructed, provides the toehold for education in any line.

Well he knows that education never hurts a man, if he is willing to learn a little something after he graduates.

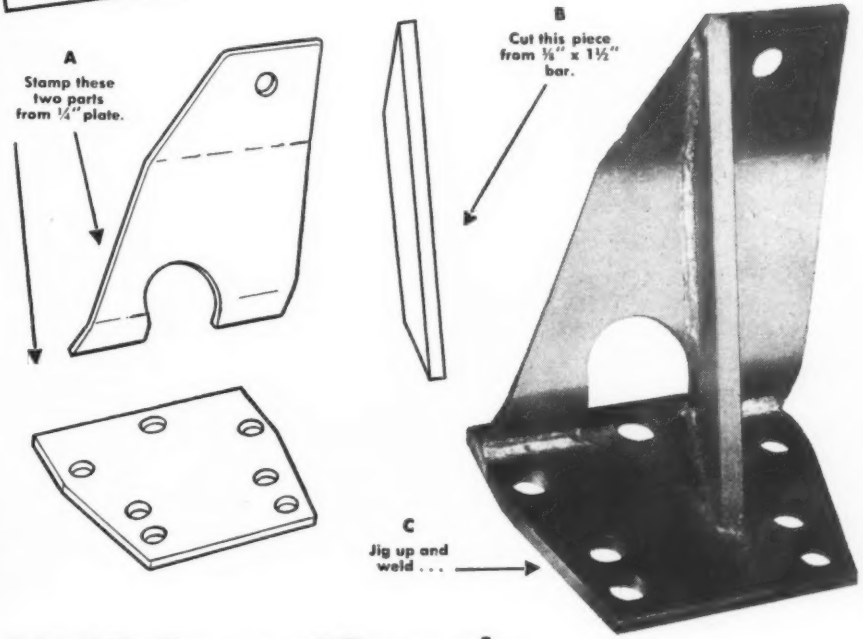
Well he knows the war was won by post-graduate thinking on production—by outsmarting outmoded procedures — through thousands of procedures such as—

"TEACH"—*he says*

HERE, PRESIDENT COMACHO, is education for any man who wonders why he cannot sell his product, made by outdated procedures, against a competitive product which is arc welded *and come out with a profit.*

The A-B-C's of Welded Design

COSTS $1.24



COSTS 64c

RESULT: Saves 60c each

THIS bracket is typical of many parts being changed over to welded design to cut costs, and to produce a stronger, more rigid and lighter product . . . one that can be constantly improved easily and quickly.

Here is the A-B-C solution to many of your problems of today. The Lincoln Engineer will gladly help you get the results *you* want. Studies in Machine Design free on request. Ask for them on your business letterhead.

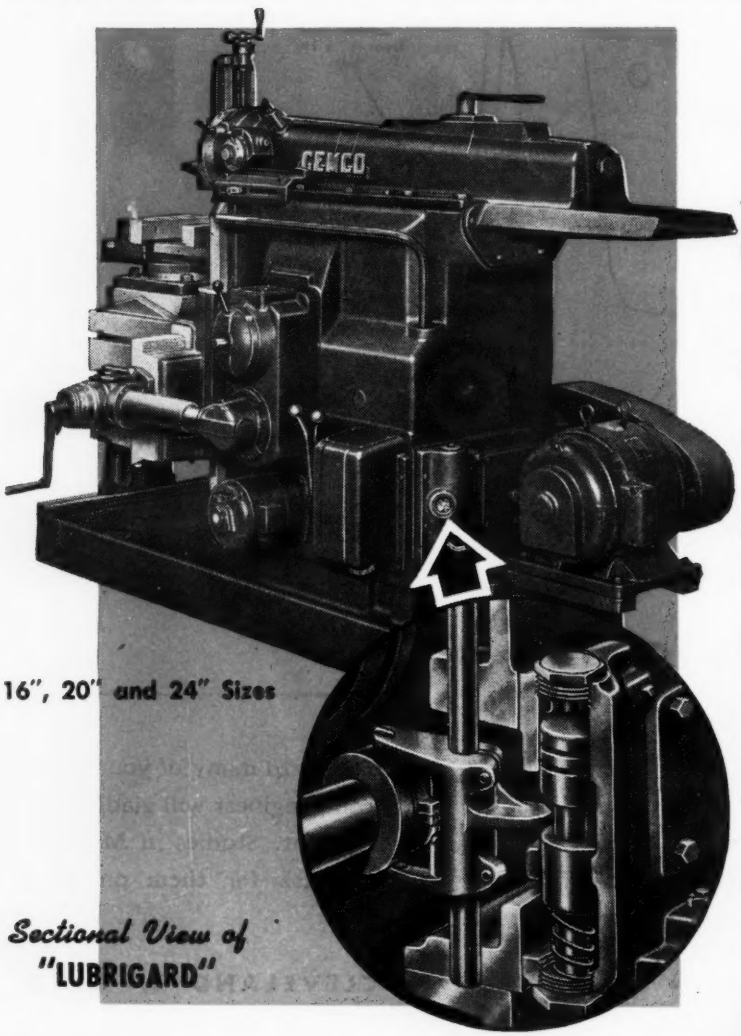
THE LINCOLN ELECTRIC COMPANY • Dept. J-1 • CLEVELAND 1, OHIO

America's greatest natural **recourse**

ARC WELDING

Only GEMCO Shapers Give You "LUBRIGARD"

This Exclusive SAFETY Device Insures Proper Lubrication, Automatically —AND Safeguards Operator, Machine and Work Piece!



16", 20" and 24" Sizes

Sectional View of **"LUBRIGARD"**

Oil under pressure forces piston down, permitting projection on clutch control lever shaft to clear recess in piston, thereby allowing control lever to move into starting position.

The function of "LUBRIGARD" is to automatically prevent the ram of the machine from being started:

1. **In case oil supply in reservoir is insufficient;**
2. **Should pressure in the system be below the minimum required;**
3. **Should a leak or failure of the oil pressure system occur;**
4. **Should the filter become clogged;**
5. **Should the drive pulley rotation be incorrect.**

In addition, "LUBRIGARD" will prevent the clutch control lever from being engaged while the drive pulley is at rest. Therefore, should the motor be started, the ram will not move unexpectedly. This prevents injury to the operator, or damage to the machine or work piece.

"LUBRIGARD" assures long, satisfactory shaper performance, because of adequate, automatically-controlled lubrication of all bearing surfaces. *It increases the Precision Life!*

GEMCO

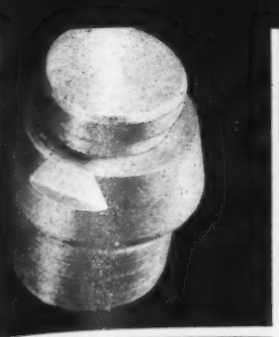
Multi-Purpose SHAPERS

Write Today for Bulletin GC-12M

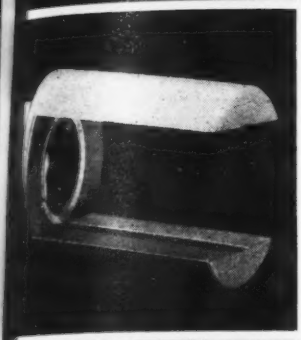
GENERAL ENGINEERING & MFG. CO.

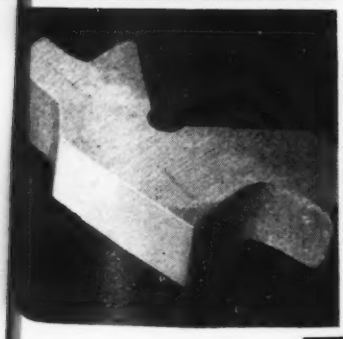
SAINT LOUIS 4, MISSOURI

MANUFACTURERS OF PRECISION MACHINERY SINCE 1917



HIGH PRODUCTION THROUGH *Surface Broaching*

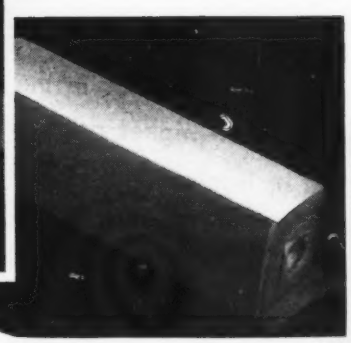
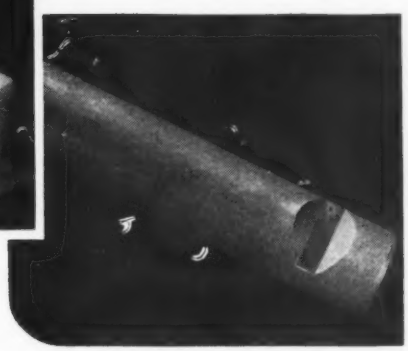




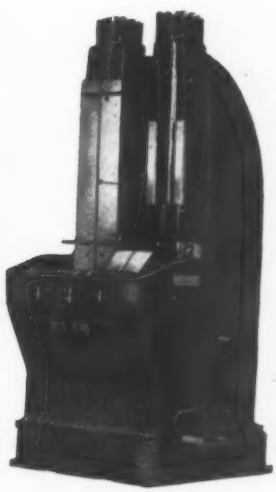
PROFITS that can only be made by increased production per machine are now possible through the use of surface broaching on many parts like these illustrations. Duplicate parts formerly machined by conventional methods are being surface broached in large quantities at worthwhile savings. We will be glad to work with you on the application of surface broaching to your work. Send blueprints with production required and we will make recommendations for the proper size Footburt Surface Broaching Machine.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

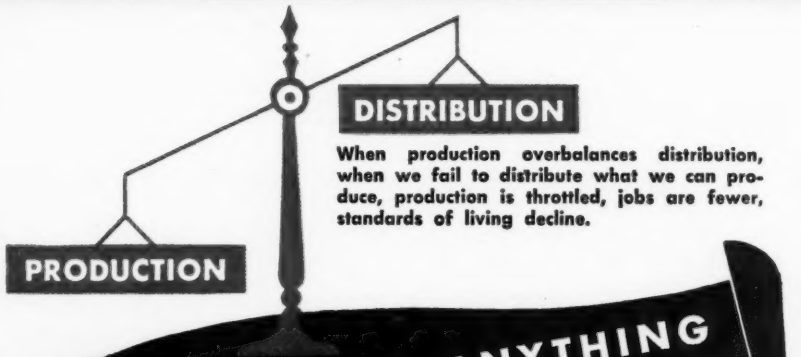



Duplex surface broaching machine. Built in several sizes to suit wide range of work.



Footburt Patented Tooth Form

FOOTBURT *Surface Broaching*


DISTRIBUTION
When production overbalances distribution, when we fail to distribute what we can produce, production is throttled, jobs are fewer, standards of living decline.
PRODUCTION

WE CAN MAKE ANYTHING ...We Must Sell All of Everything We Make

For a long time we in America have derived great comfort and assurance from the knowledge that we have the industrial ability to produce anything we may need or want. We have tied our wagon to the bright star of producing more products at higher wages to sell at lower prices.

This concept of production has brought us the largest expansion in a standard of living of any people in history.

But, while we have always been able to make anything, we have not always been able to sell all of everything we could make. We have not devoted the same enterprising energy to expanding distribution that we have to production. So, in the past, for immediate short swing relief we have resorted to government imposed restrictions on production and distribution. This expedient did not bring worth-while relief, for in the end it added up to fewer jobs, less production—higher prices.

If commerce and industry will use its inspirational ability and ingenuity to find better, cheaper methods of distribution per unit our goal of full employment may easily be accomplished and we can return to the enviable position of enjoying an expanding standard of living.

MICROMATIC HONE CORPORATION
DETROIT 4, MICHIGAN

THESE MACHINES HAVE HELPED BRING VAST IMPROVEMENT IN WAR "DISTRIBUTION" VEHICLES . . . . . .

...they will do THE SAME for Distribution in Peacetime

While cost is a secondary consideration in distribution of war materials, other needs parallel peacetime distribution. Lighter, more easily operated equipment—higher pay loads—easier maintenance, and less of it—are all vital. Micromatic Honing machines have helped wartime distribution to these goals—will do the same for industry after the war. At the same time they will help lower initial and operating costs of distribution machinery—lower costs of goods delivered.

MODEL 705

VERTICAL HYDROHONER

Micromatic Model 705 Multiple Spindle Vertical Hydrohoner has built-in automatic Microsize Control which gauges work automatically—holds within tolerance of .0001" for geometric accuracy and .0003" for *uniform diameter size*—automatically stops honing cycle when correct size is reached. For internal honing or bores ¼" to 2" diameter. Rotary indexing work fixture provides high production. Usually recommended for maximum stock removal ranging from .0005" to .0015" on hardened parts—.001" to .010" on soft or medium hard. (Illustrated above, left).

Precision sphericity without measurable error is generated on ball studs by the Micromatic Ball Stud Honer.

Removes .030" stock on diameter from turned heat treated forgings.

Precision honing of long pieces—external or internal—is the work of the Micromatic Horizontal Floor Type Honer. Either hydraulic or manual control or tools. Set-ups available to generate either cross-hatch or co-directional finish patterns.

MODEL 702 Single Spindle

Type HYDROHONER

Single Spindle Type Micromatic Hydrohoner Model 702 for rapid production honing of bores or cylindrical surfaces up to 2" in diameter. (Illustrated above, right).

Silver plated bearings are production honed on a Micromatic Horizontal. Costs were reduced 50% from previous methods.

MICROMATIC HONE CORPORATION

DETROIT 4, MICHIGAN

DISTRICT OFFICES: 614 Empire Building, 206 South Main Street, Rockford, Illinois • 129 Church Street, New Haven 10, Connecticut
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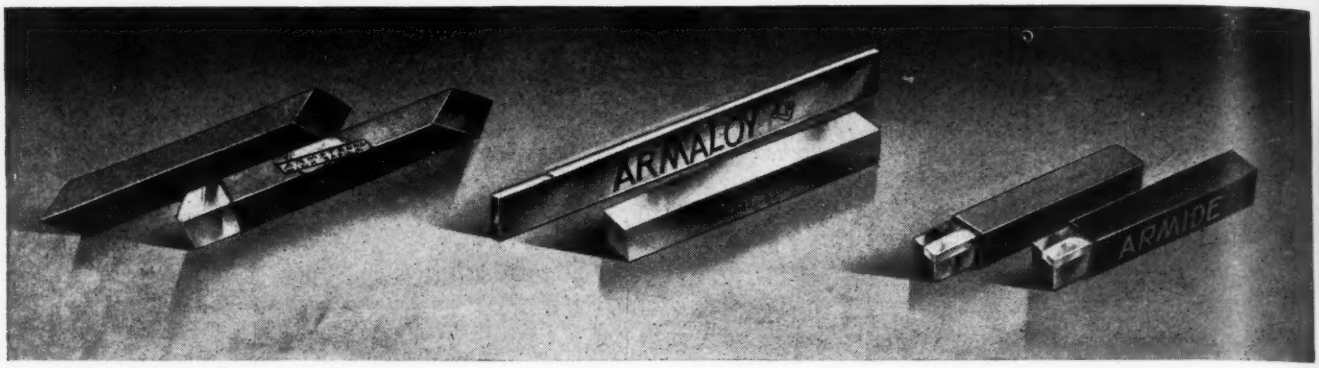
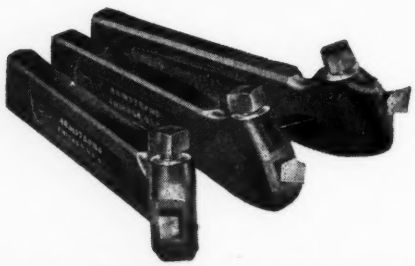
MAKERS OF HONING MACHINE TOOLS

ARMSTRONG

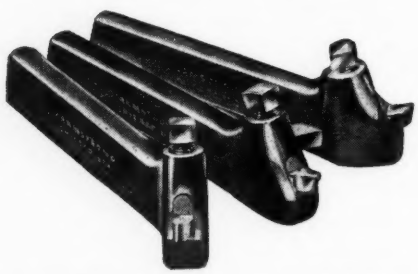


100-150 f.p.m. 200-300 f.p.m. 300-600 f.p.m.

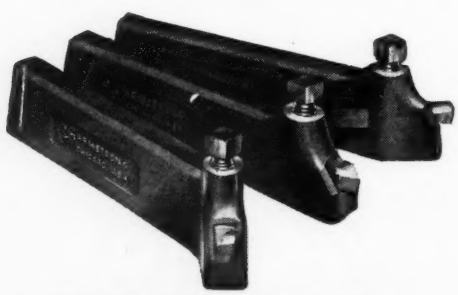
Whatever the Cutting Speed . . .



ARMSTRONG TURNING TOOLS
for High Speed Bits



ARMSTRONG CA TOOL HOLDERS
for ARMALOY Bits



ARMSTRONG TOOL HOLDERS
for ARMIDE Cutters

Whatever cutting speed an operation calls for, there is a correct ARMSTRONG TOOL HOLDER that takes the proper bits, blades or cutter to do the operation economically and efficiently.

ARMSTRONG HIGH SPEED

For general tool room and machine shop use, ARMSTRONG HIGH SPEED Bits and Blades are unsurpassed. They will stand up to speeds and feeds far greater than those generally accepted as "standard".

ARMALOY

ARMALOY Bits and their corresponding ARMSTRONG CA TOOL HOLDERS are recommended for machining sand-fitted castings, malleable iron, non-ferrous metals, rubber, plastics and for machining steel on modern high production machines, where sufficient speed and feed can be obtained to take advantage of their greater cutting capacity.

ARMIDE

ARMIDE Carbide-Tipped Cutters and ARMSTRONG Carbide Tool Holders make the use of Carbide-tipped tools practical in even the smallest shop. Coming in two grades ARMIDE Red (for steel) and ARMIDE Gray (for cast iron, brass, aluminum and non-ferrous materials). They easily machine hard and tough steels, and stand up to the highest speeds and heaviest feeds, and increase the interval between tool re-grindings as much as 10 to 50 times.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

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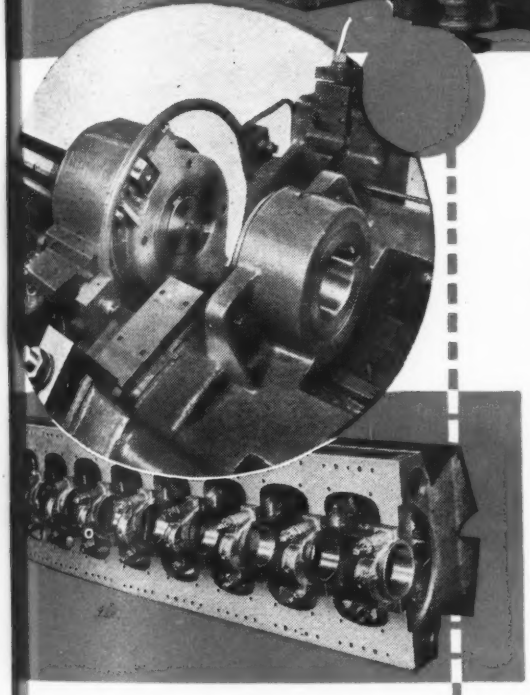
ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

DAVIS

SPECIAL TOOL BORES 9 MAIN BEARINGS simultaneously

Davis Special Straddle Facing and Line Boring Tool used on W. F. and John Barnes Machine.



Notched supporting bushings permit boring cutters to pass through, block is off center as bar is traversed.

Diesel block showing 9 main bearings which are bored simultaneously.

Bar Rotates in Bronze Bushings Between Alternate Bearings... Alignment Held to .004" in 150" Length ...9 Rough, 9 Finish and 2 Facing Cuts Made

This difficult bearing machining job is successfully made with a Davis Special Boring Tool on a W. F. and John Barnes Machine. Simultaneous operations on the diesel block include: rough and finish bore 9 main bearings; rough and finish bore generator rabbet and straddle face one main bearing.

The outstanding feature of this machining operation is the design and manner in which cutters are mounted on the boring tool for simultaneous operation. The engine block is placed off center while the bar is passed through the bearings and bronze guide bushings. The latter are notched to permit cutting tools to pass through. When the bar is in place, the cylinder block is moved hydraulically into correct machining position and manually clamped. The drive spindle is engaged and both rough and finish operations on all 9 bearings and straddle facing are completed before the bar is retracted. The bronze guide bushings insure correct alignment of all bearings.

ENGINEERING HELP

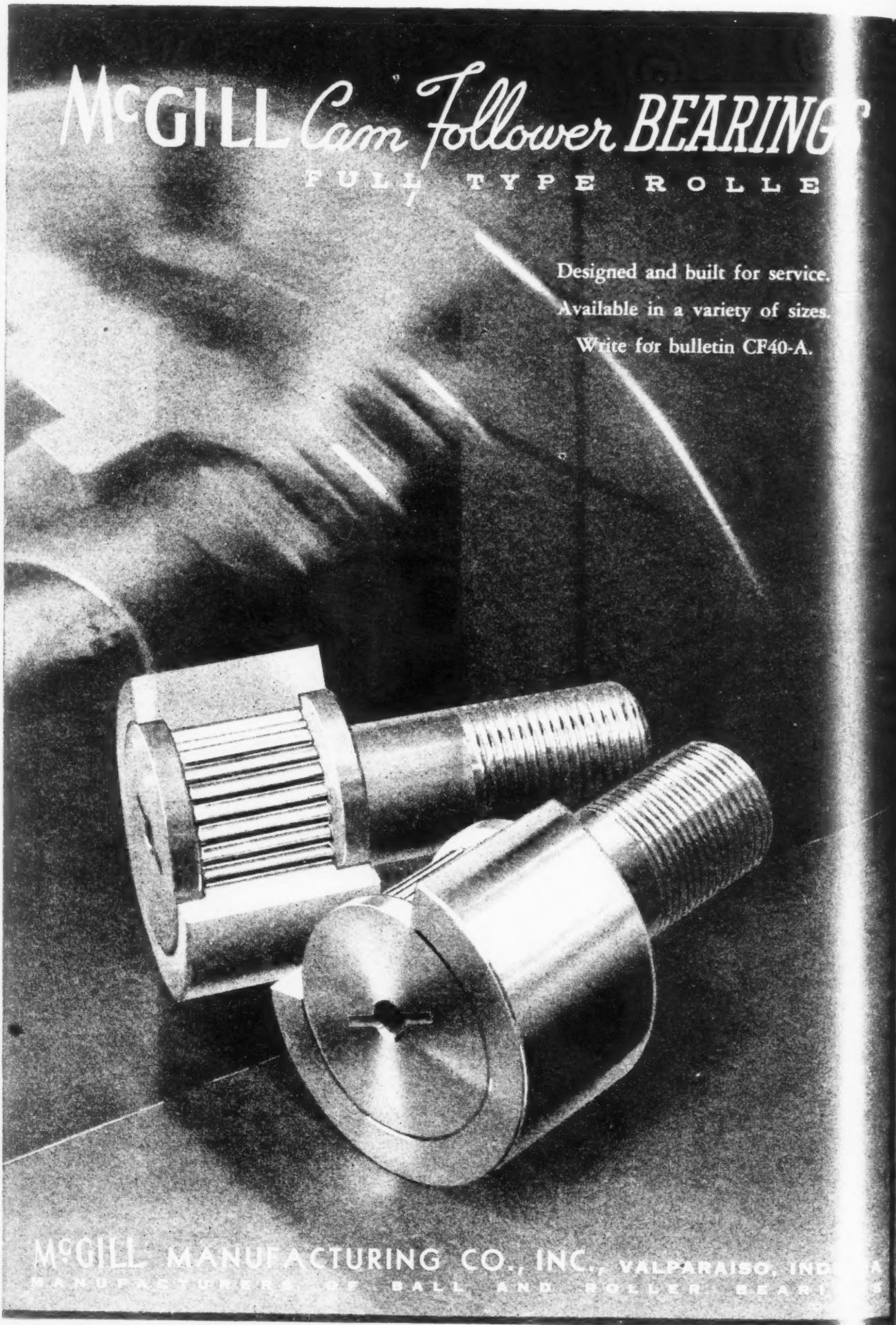
Special boring tools of similar design may be helpful now or in the future in your own plant. Davis engineers will be glad to recommend suitable standard or special boring tools for any boring machine or job. There is no charge for this engineering help which will show you how to reduce costs and increase production through combining operations.

DAVIS BORING TOOLS

Free Data Write today for additional information on Davis Boring Tools. Learn how to combine many operations into one. Please indicate your business connection. MA

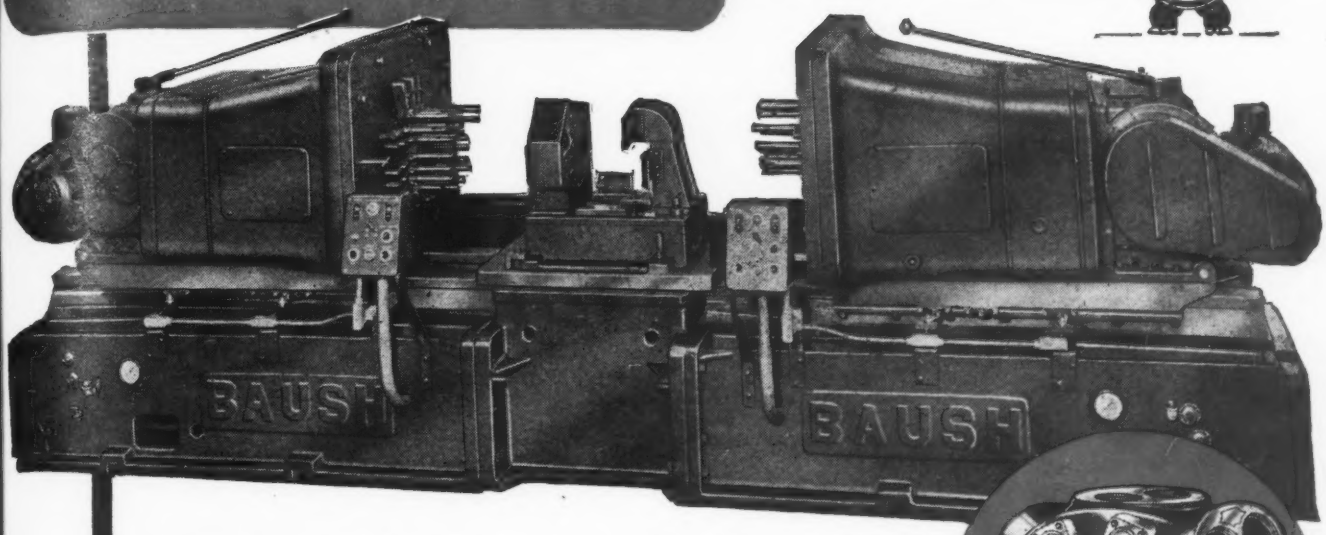
DAVIS BORING TOOL DIVISION
LARKIN PACKER COMPANY, INC., ST. LOUIS 14, MO.

The Multi-Cutter Boring Tools that produce more at less cost


McGILL Cam Follower BEARINGS
FULL TYPE ROLLE
Designed and built for service.
Available in a variety of sizes.
Write for bulletin CF40-A.
McGILL MANUFACTURING CO., INC., VALPARAISO, IND. A
MANUFACTURERS OF BALL AND ROLLER BEARI S

SPEED UP CIVILIAN *Necessities...*

"Says Stop-Watch Pete of BAUSH"



Baush 2-way Type W-6 Horizontal Hydraulic Multiple Spindle Drilling Machine has two 18"x24" adjustable type joint driven heads with 18" maximum stroke for each head. Left head furnished with 22—1" diameter spindles—Right head with 16—1" diameter spindles—all with short dowelled arms mounted on support plates. Convenient push button controls permit operation of machine from either side.

The Baush Machine Tool illustrated has just been completed for one of the largest manufacturers of air conditioning and refrigeration equipment to save TIME and speed up economical production of essential civilian equipment.

This machine is furnished with several size fixtures adapted for drilling holes in the pump and seal ends, and hand hole covers of various air conditioning and refrigeration crankcases.

Perhaps YOUR civilian production can be speeded up by special purpose Baush Machine Tools. . . . A wire, phone call or letter will bring our Engineers to your plant to discuss your problems – there's no obligation.

Descriptive literature sent upon request.

BAUSH

MACHINE TOOL CO.

SPRINGFIELD 7, MASSACHUSETTS

WHEN YOU NEED PRECISION-BUILT SMALL PUMPS . . . Specify TUTHILL

MODEL C SAVES MONEY IN GENERAL PURPOSE SERVICE

Recognized for low first cost, negligible maintenance and long economical service, Tuthill Model C is a dependable general purpose pump. It is simple in design, compact and built for rugged service on non-corrosive liquids. Operates efficiently in either direction of rotation. Capacities from 1 to 200 g.p.m. at pressures up to 100 p.s.i. Direct drive, belt drive, V-belt units and stripped models available. Write for Model C bulletin.

TUTHILL PUMP COMPANY

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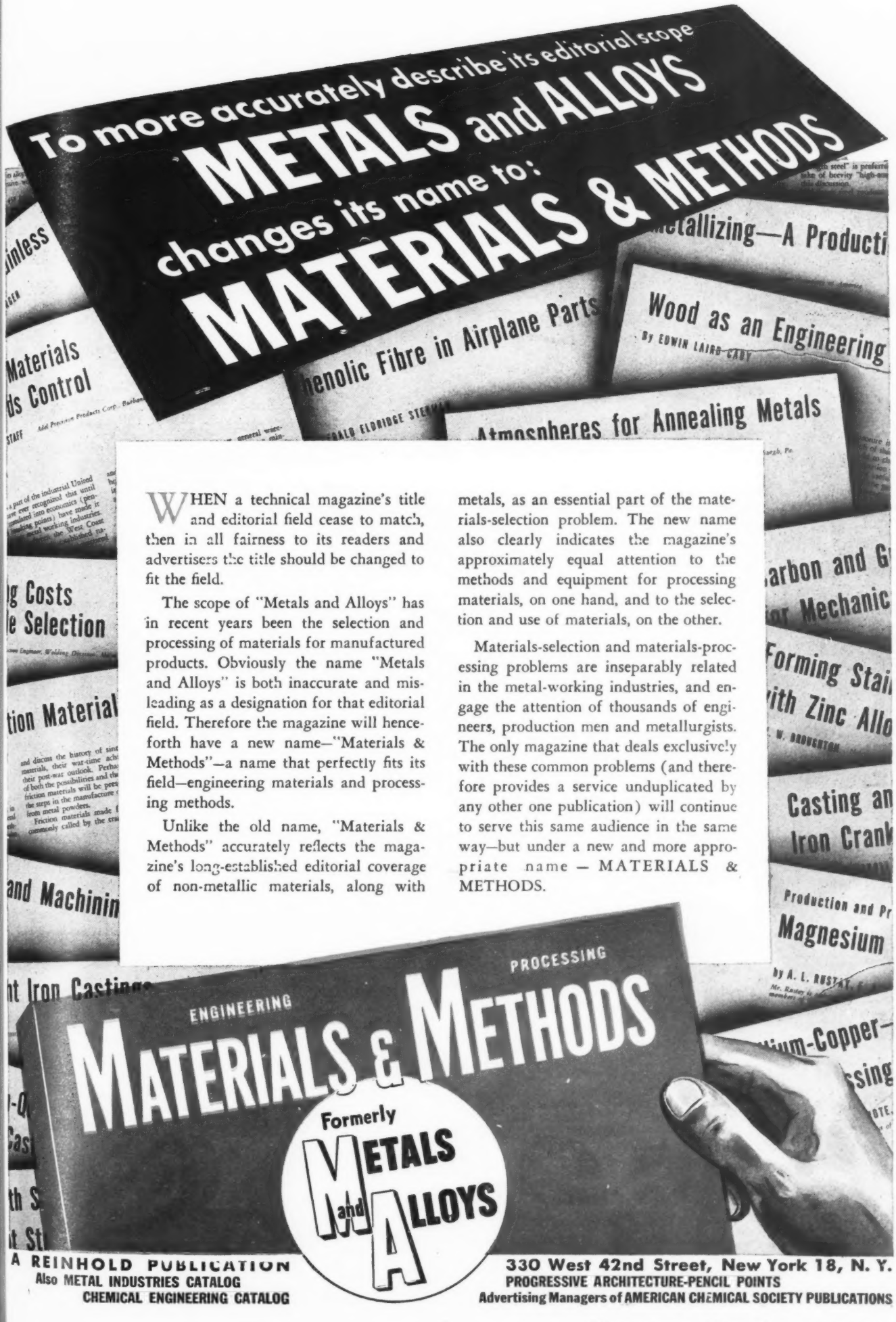

WHEN a technical magazine's title and editorial field cease to match, then in all fairness to its readers and advertisers the title should be changed to fit the field.

The scope of "Metals and Alloys" has in recent years been the selection and processing of materials for manufactured products. Obviously the name "Metals and Alloys" is both inaccurate and misleading as a designation for that editorial field. Therefore the magazine will henceforth have a new name—"Materials & Methods"—a name that perfectly fits its field—engineering materials and processing methods.

Unlike the old name, "Materials & Methods" accurately reflects the magazine's long-established editorial coverage of non-metallic materials, along with metals, as an essential part of the materials-selection problem. The new name also clearly indicates the magazine's approximately equal attention to the methods and equipment for processing materials, on one hand, and to the selection and use of materials, on the other.

Materials-selection and materials-processing problems are inseparably related in the metal-working industries, and engage the attention of thousands of engineers, production men and metallurgists. The only magazine that deals exclusively with these common problems (and therefore provides a service unduplicated by any other one publication) will continue to serve this same audience in the same way—but under a new and more appropriate name — MATERIALS & METHODS.

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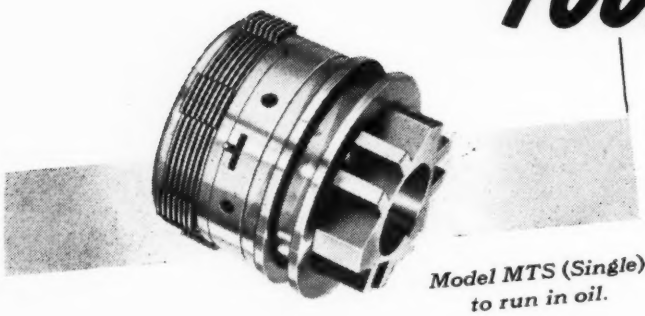
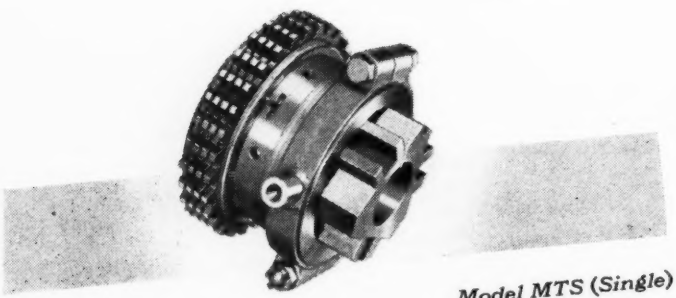
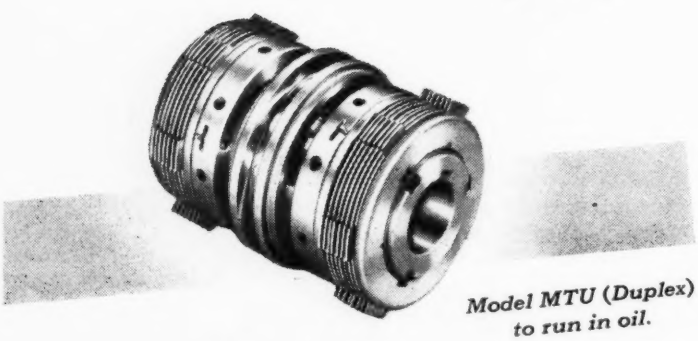


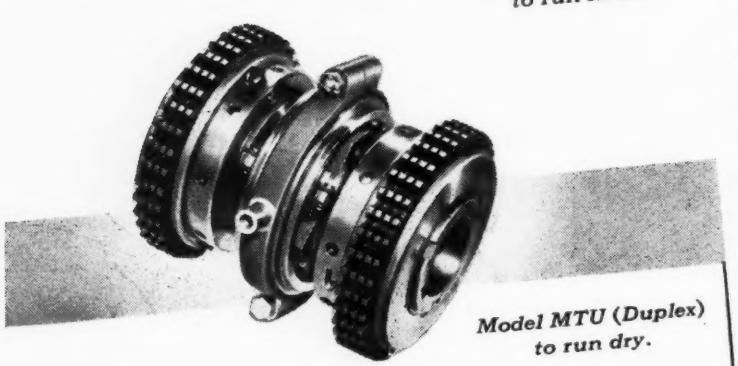
Model MTS (Single) to run in oil.



Model MTS (Single) to run dry.



Model MTU (Duplex) to run in oil.



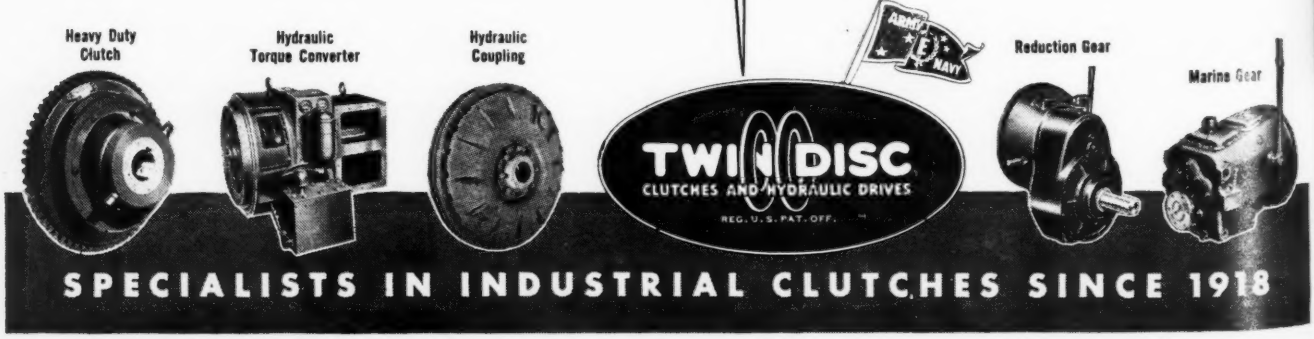
Model MTU (Duplex) to run dry.

If you have a new unit which requires a connecting link between driving and driven parts—whether that link be a friction clutch or a hydraulic drive—the Twin Disc Clutch Company offers you these advantages:

1. A broad line of standard friction clutches, hydraulic couplings and hydraulic torque converters*, covering the widest variety of industrial applications.
2. Over a quarter-century of continuous specialization in the building of industrial clutches . . . in developing streamlined production methods which assure uniform quality with lowest practical cost.
3. Adequate records on which performance, operating characteristics and wear-life may be accurately predicted.
4. A competent group of field and factory engineers, skilled in the application of both friction clutches and hydraulic drives, backed by a service organization of 9 factory branches and 31 parts stations.

That is why so many nationally known machinery and equipment manufacturers have found they can speed production, assure efficient performance and reduce post-sale service by standardizing on Twin Disc Clutches and Hydraulic Drives. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).

**Lysholm-Smith type.*



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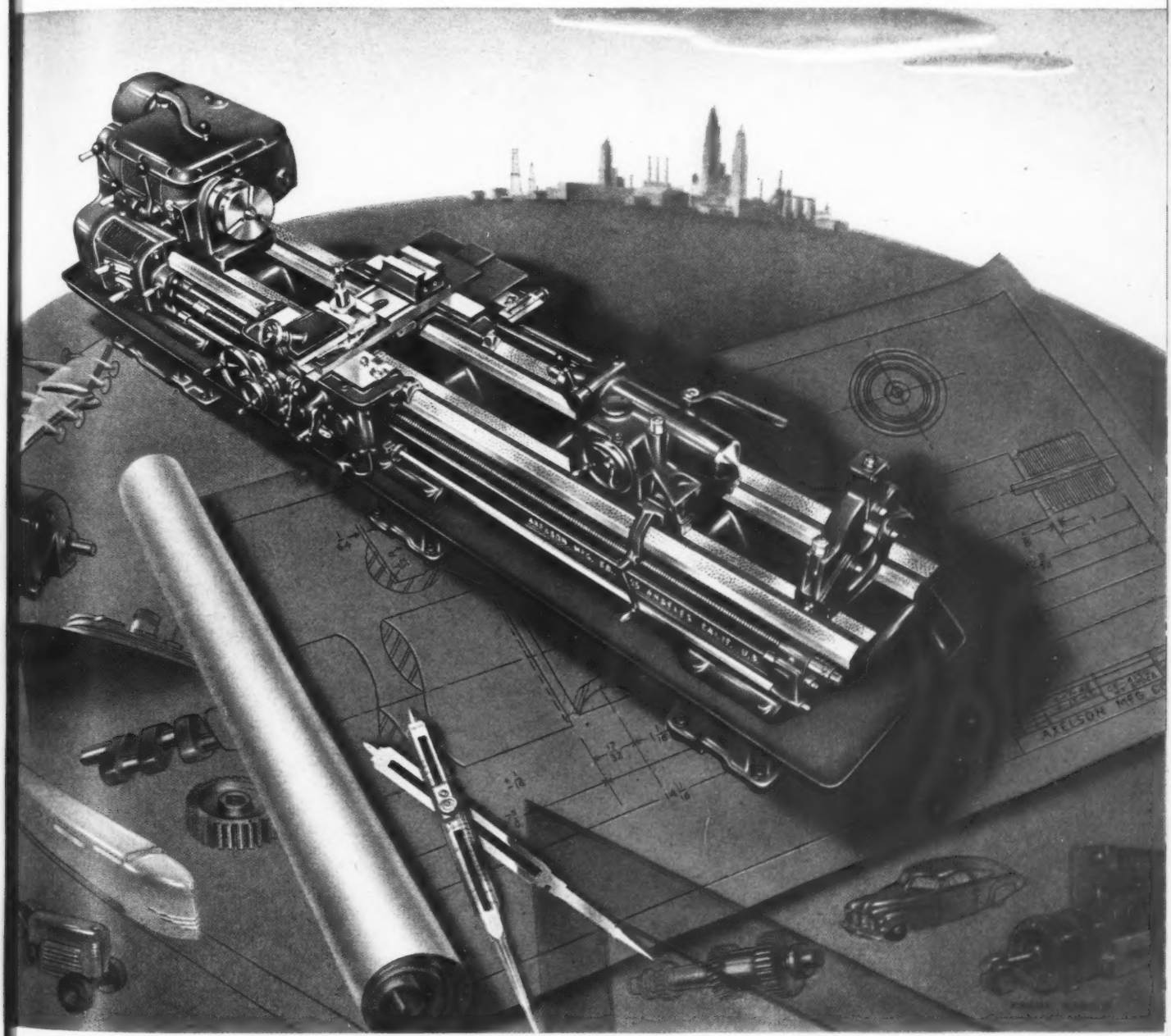

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Axelson Lathes of various lengths are manufactured in 14, 16, 18, 20, 25 and 32-inch sizes.

AUTOMATIC *Grooving Tools* FOR HIGHER PRODUCTION

You can groove faster, more accurately and economically with a Scully-Jones recessing tool. These automatic tools are suitable for production work on Turret Lathes, Automatic Screw Machines, Drill Presses or Horizontal Boring Mills for grooving, undercutting, recessing, necking and facing.

Adjustment is provided for the tool bit after grinding as well as location of groove and correct depth setting to control the diameter of recess.

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Tracer Control SAVED 120 HOURS

Duplicating Eight (8) Die Molds for *Plastics*

8 Dies Duplicated from 1 Original Master

ON THIS TYPICAL JOB that previously took 40 hours per die—the Gorton Duplicator gave this manufacturer a Tracer-Controlled machining method that saved 15 hours' actual machining time per die in the production of 8 die molds for plastic handles. Simplicity of setups and Gorton improved finish which eliminated any hand finishing operations brought additional savings.

You will find the Gorton 8½-D Duplicator the ideal machine tool for all kinds of die and mold work, capable of duplicating any part accurately with extremely fine finish. On many war jobs today, Gorton Duplicators are paying for themselves in savings effected.

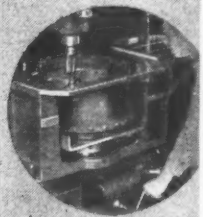
PRODUCTION DATA

Material—Machine Steel.
Operation—Duplicating Die Molds for Plastic Handles.
Speed—Roughing, 500 r.p.m.
Finishing, 1100 r.p.m.
Time—25 Hours per Mold, Floor-to-Floor.
Holding Method—Simple Table Vise.
Accuracy—.001" with Extra Fine Finish.
Savings with Tracer Control—15 Hours per Die—Total Savings—120 Hours per 8 Dies.

FREE ENGINEERING SERVICE

There is a "Tracer-Control" solution to your machining problem. Submit it to Gorton engineers who have had more than 50 years of practical experience in the development of Tracer-Controlled Milling. Call on your nearest Gorton Dealer, or write to the Gorton factory at Racine, Wisconsin.

The *Right* Size
The *Right* Type of Machine for Every Job . . .
From 2 oz. to 2 ton DIE BLOCKS



Tracer-Controlled MILLING

Tracer-Controlled DUPLICATING

Tracer-Controlled ENGRAVING

Tracer-Controlled ETCHING

GORTON *Precision* MACHINES

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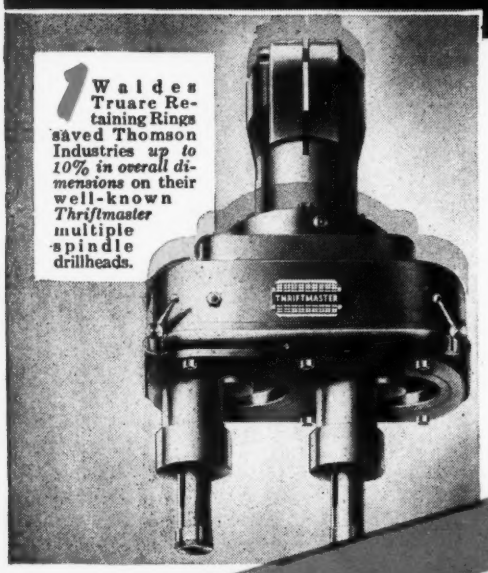
Another Proof that Waldes Truarc Retaining Rings hold moving parts together better!

1 Waldes Truarc Retaining Rings saved Thomson Industries *up to 10% in overall dimensions* on their well-known *Thriftmaster* multiple spindle drillheads.

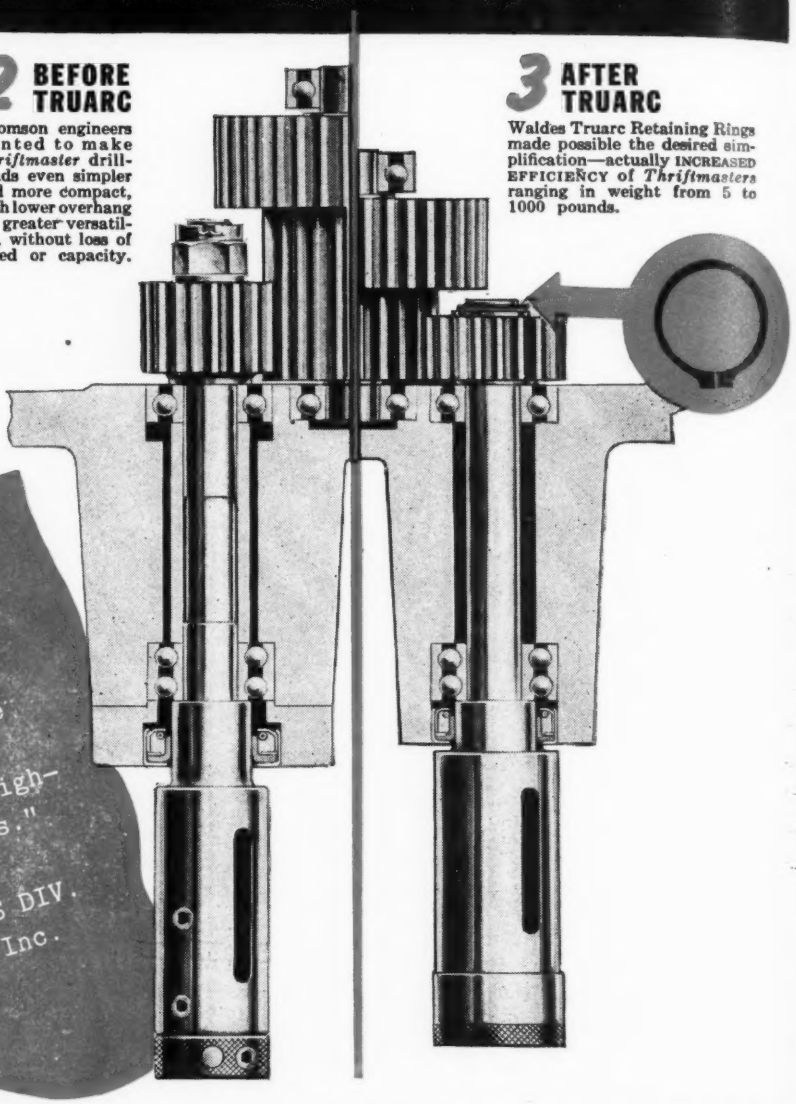


2 BEFORE TRUARC

Thomson engineers wanted to make *Thriftmaster* drillheads even simpler and more compact, with lower overhang for greater versatility, without loss of speed or capacity.

3 AFTER TRUARC

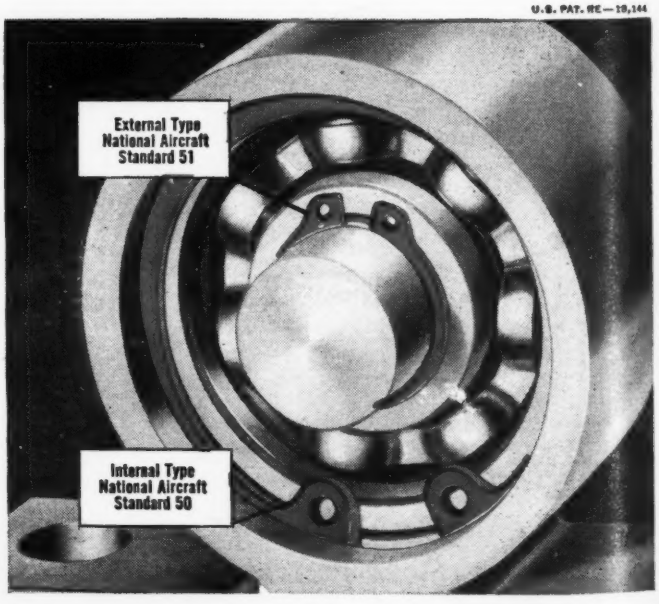
Waldes Truarc Retaining Rings made possible the desired simplification—actually INCREASED EFFICIENCY of *Thriftmasters* ranging in weight from 5 to 1000 pounds.



"Waldes Truarc Retaining Rings enabled us to make substantial time and labor savings in production of THRIFTMASTER drillheads...and made possible a much lighter, handier, more rugged tool, exceeding our highest performance requirements."

(Signed)
THRIFTMASTER PRODUCTS DIV.
Thomson Industries, Inc.

U.S. PAT. RE—19,144



IN HOLDING and positioning machine parts, Waldes Truarc Retaining Rings offer distinct advantages over nuts, shoulders, collars and pins. They save cost by simplifying and speeding up production. They make assembly and disassembly much quicker, easier. They can be put on and taken off time and time again—and still retain the perfectly true circularity that gives them their never-failing grip. Test Waldes Truarc Retaining rings in your products and in the machines that make them. We'll furnish samples and complete data. Write Dept. 0-11.

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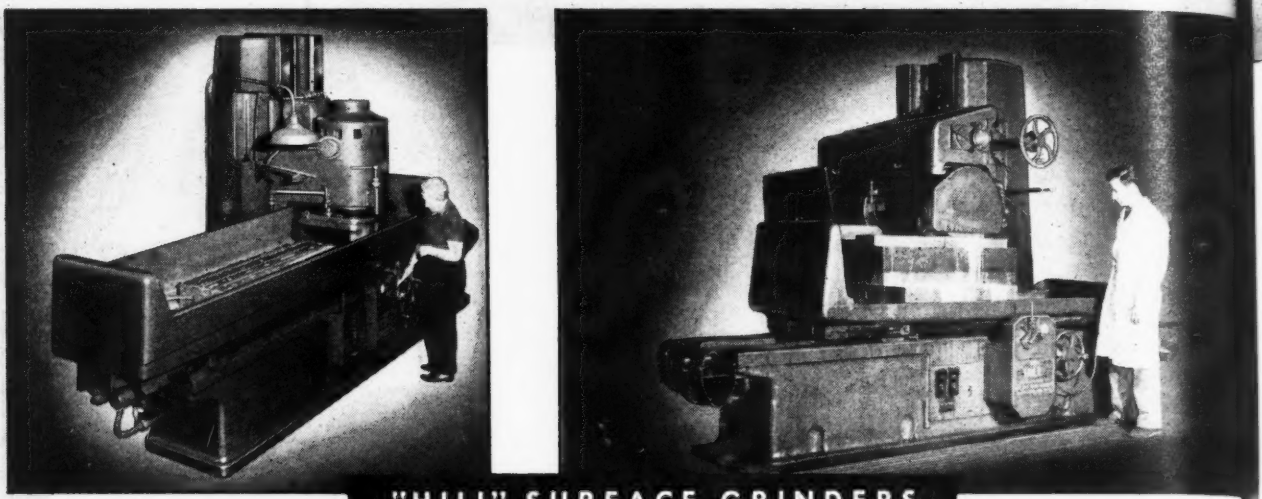
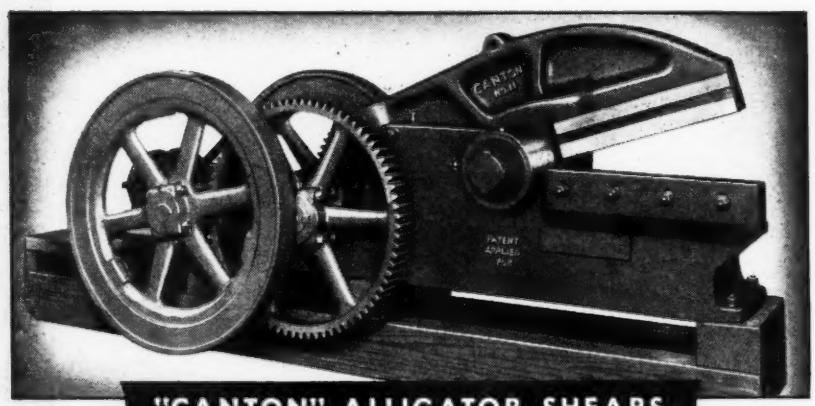
HILL
TOOLS FOR



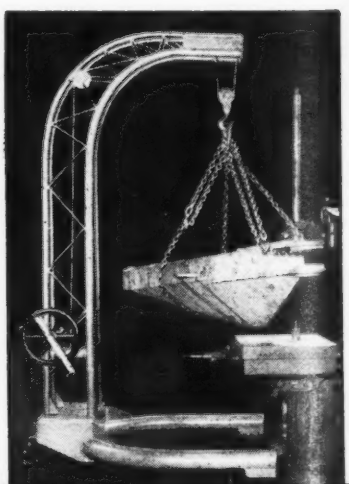
"HILL" SURFACE GRINDERS

"HILL" Heavy Duty Hydraulic Surface Grinders are manufactured in two "Companion" types — Horizontal and Vertical Spindle. Both styles are *"Open Side"* design, affording convenience and accessibility to the work in process, and featuring Massive Construction . . . 100% Hydraulic Table Drive — Built-in Spindle Motor — Centralized Controls — and Permanent Accuracy. Vertical Grinders furnished in table widths 18", 24", and 30". Horizontal Grinders furnished up to 36" wide. Table lengths range from 60" to 240".



"CANTON" ALLIGATOR SHEARS

For years the "Canton" Shear has been the most practical and efficient machine for processing industrial scrap. Available in all sizes, — Right or Left Hand, — High or Low Knife design.



"CANTON" PORTABLE CRANES

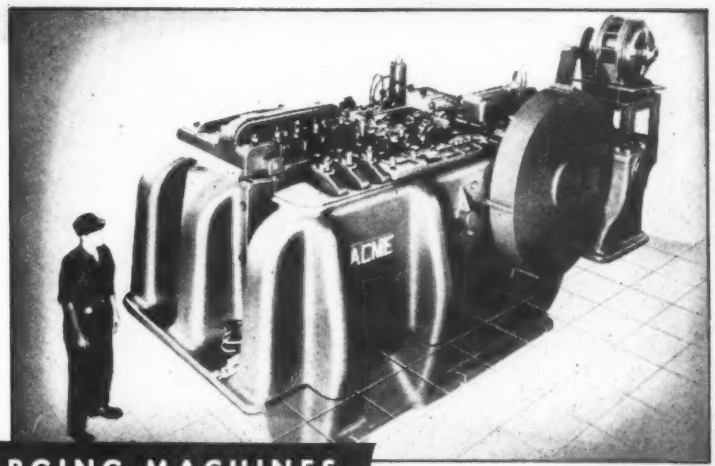
Fabricated Steel Portable Floor Cranes of modern design. The handiest tool in the Shop. Made in eight sizes, one to three ton capacity.

The HILL ACME

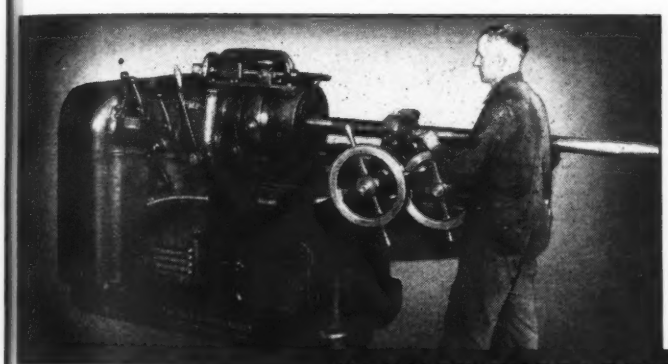
PLANTS AT 6400 BREAKWATER AVENUE, N.W.

ACME INDUSTRY

"Acme" XN Forging Machines are of sound and proven design, incorporating rigid construction throughout, and simplicity of operation. They are available in ten sizes ranging from 1" to 5½" inclusive.

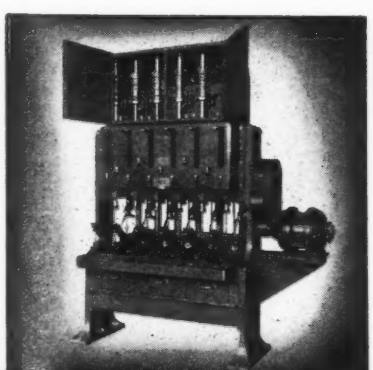


"ACME" FORGING MACHINES



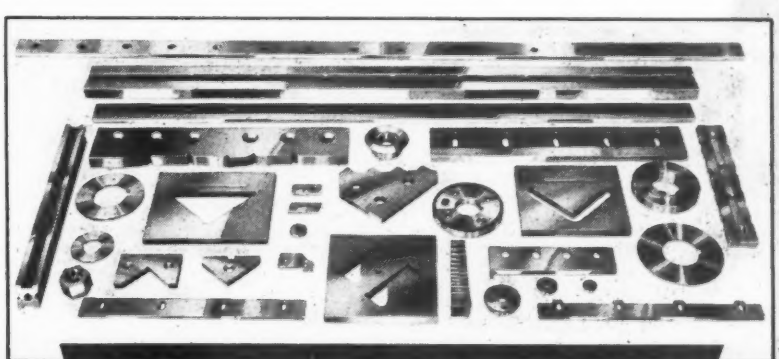
Single and Double Spindle "Acme" XL Threading Machines are equipped with the "Acme" tangent die head insuring economical and accurate high speed production. Furnished in sizes from 1" to 3" capacity.

"ACME" THREADING MACHINES



"ACME" TAPPING MACHINES

A complete line of semi-automatic Tappers for accurately threading nuts and pipe couplings.

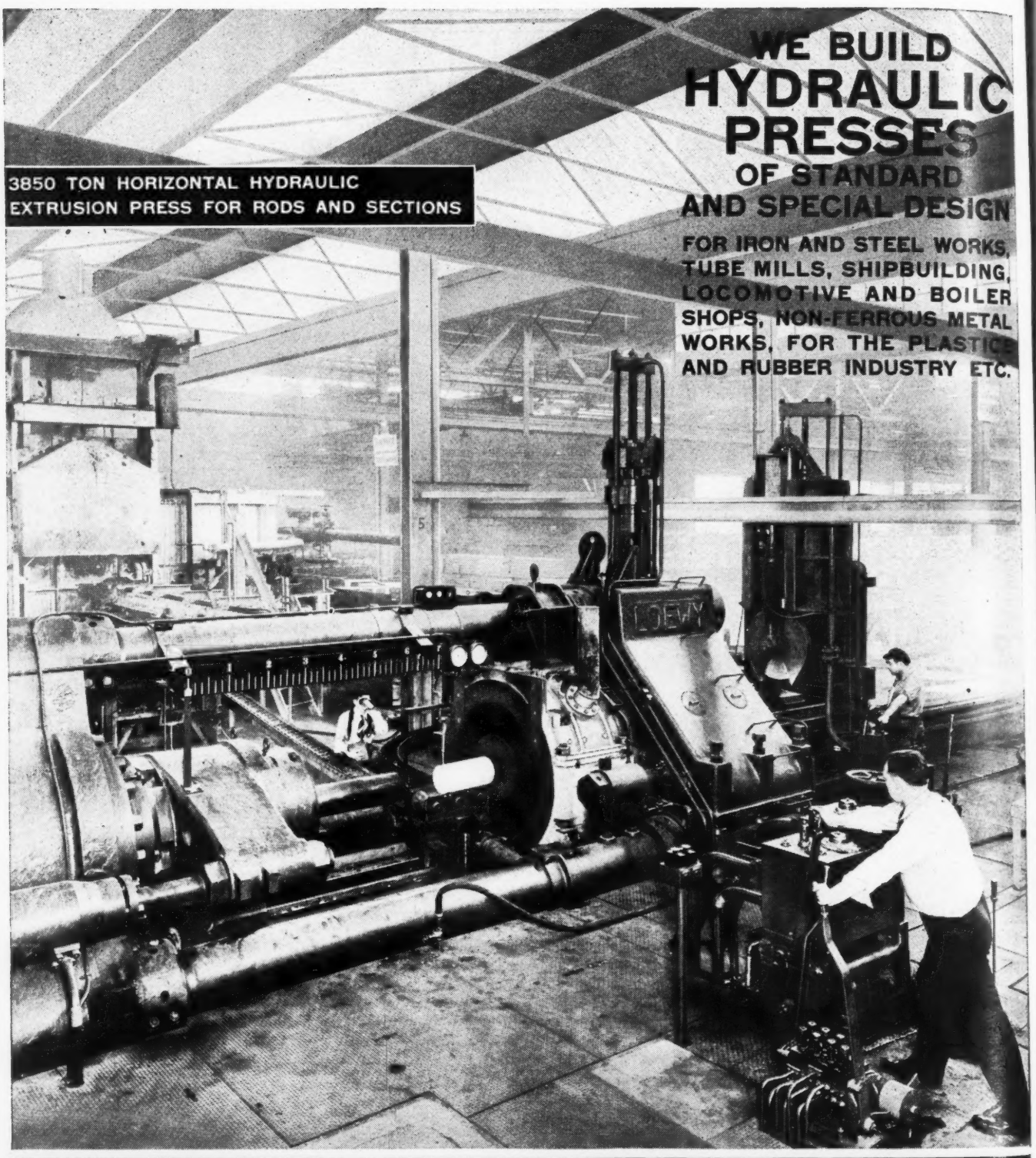


"CLEVELAND" KNIVES AND SHEAR BLADES

Solid and Laid Steel Shear Blades • • • Rotary Slitting and Side Trimming Knives • • • Metal Cutting Machine Knives, and Knife Sharpening Service.

COMPANY *Cleveland 2, Ohio*

AND 4533 ST. CLAIR AVENUE, N. E.



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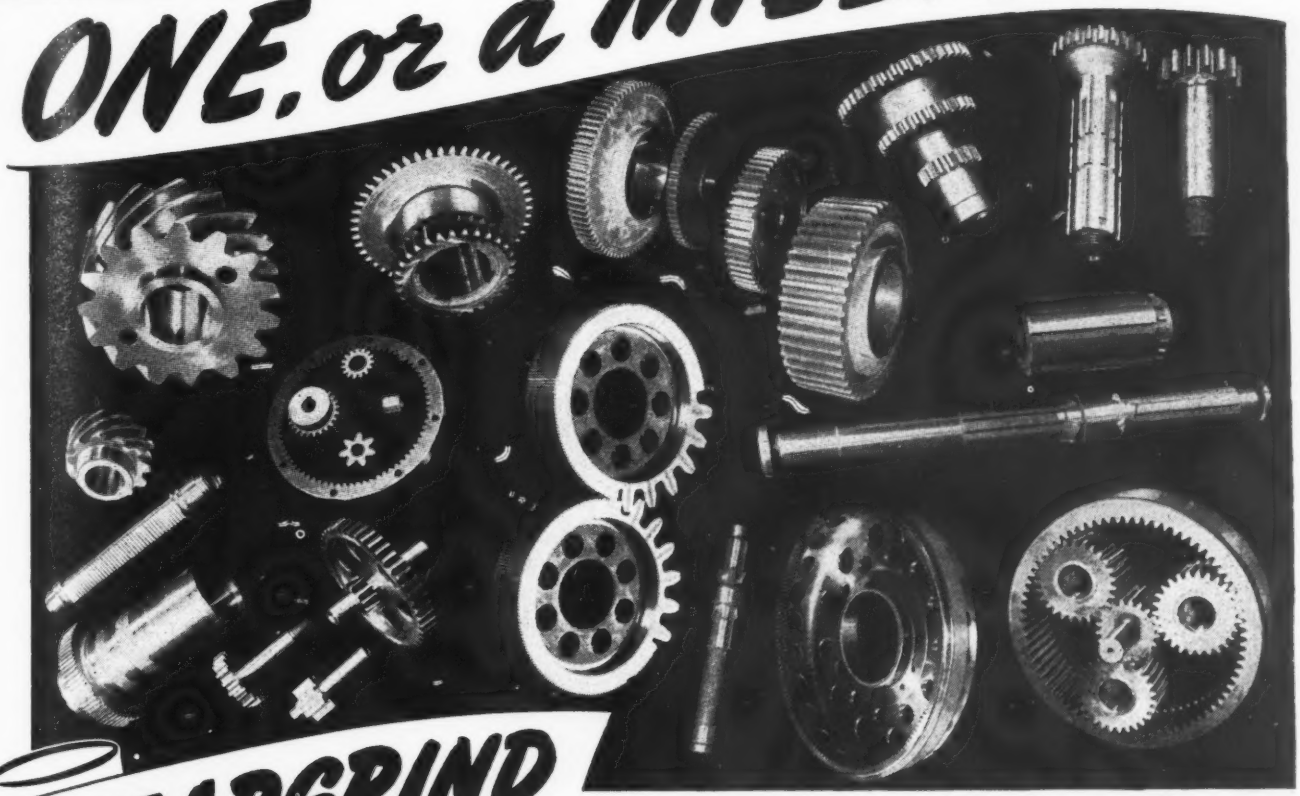
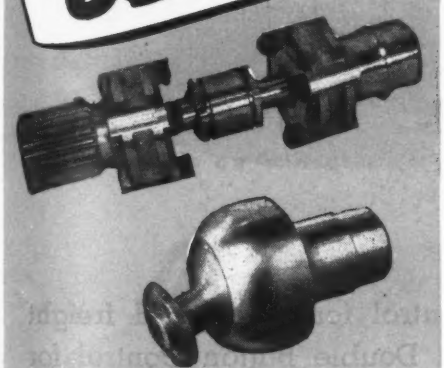
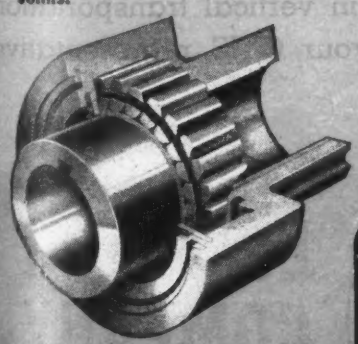


GEARGRIND CONTRACT GRINDING SERVICE



HIGH SPEED, Constant Velocity Universal Joints, and RZEPPA Universal Joints.



FORMSPRAG—the Full Complement Over-running Clutch.

For a single piece or production runs, GEARGRIND has the plant facilities, equipment and know-how to meet your requirements on all types of Formed Wheel Grinding. Your work will be accurate, finely finished, and delivered on time. This service is available for:

External Spur Gears

From ½" to 33" O.D. 1¼ to 64 pitch. Pinion gears up to 60" between centers. Any desired pressure angle.

Internal Involute Spur Gears and Splines

From 2½" to 17" P.D. 4 to 64 pitch. Maximum face width 5". Any desired pressure angle. Number of teeth up to 200. Maximum O.D. 26". V shaped Splines of any included angle.

External Helical Gears

From 1" to 13¾" O.D. 4 to 28 pitch. Face width up to 2¾". Left or right hand helix. Minimum lead 8¼". Any desired pressure angle.

Splines and Serrations

Up to 16" diameter, 60" between centers, parallel sides or V shaped of any included angle.

Internal Helical Gears

We have limited facilities for grinding this type gear.

We have ground experimental gears with 160 teeth, 10 diametral pitch. 22°-30' pressure angle. 26° helix angle. 17¾" O.D. We invite inquiries for this type of work.

Straight or Oblique Racks

Lengths up to 26". Width of work up to 4". From 3 to 32 pitch. Any desired pressure angle.

We also produce master gears, spline gauges, spline work arbors, plug gauges, cluster gears and gears of cramped design, punches, dies, sprockets, and master index plates. Salvage grinding of gears, which due to distortion in heat treat or errors in machining would otherwise be considered scrap.

Write, wire or phone for full information.

The GEAR GRINDING MACHINE COMPANY
DETROIT 11, MICH. U.S.A.

OTIS FREIGHT ELEVATORS
. . . A Production Asset

The efficiency of tomorrow's production will be influenced by the handling capacity of freight elevators.

The smooth dependable performance of OTIS Freight Elevators is an assurance of more tonnage hauled . . . more time saved.

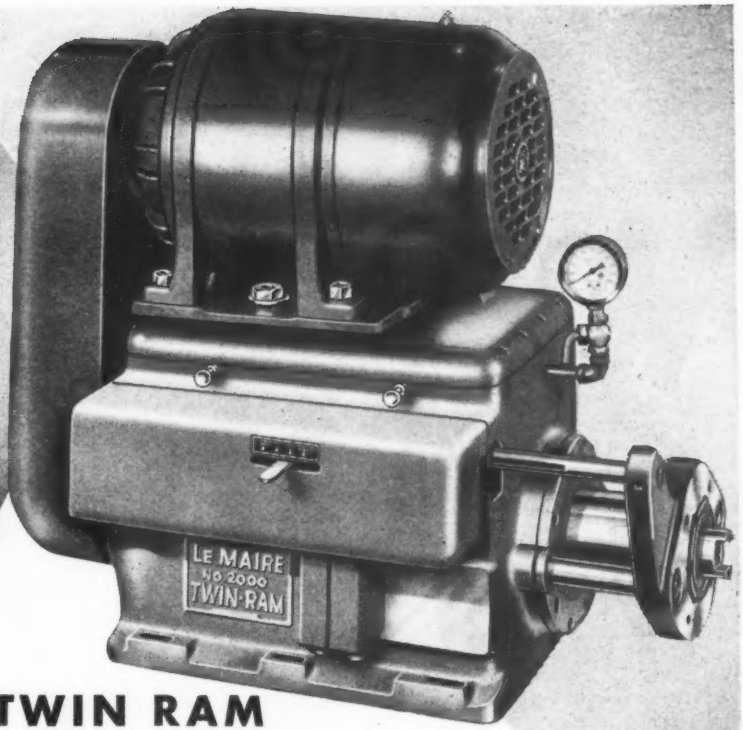
OTIS Freight Elevators can be arranged for dispatching to predetermined floors — to fit exactly the requirements of any cycle of operations.

Ask your OTIS representative about Collective Control for high-speed freight elevators and Double Button Control for moderate-speed freight elevators.

For the finest in vertical transportation tomorrow, call your OTIS representative today.

Otis ELEVATOR COMPANY
OFFICES IN ALL PRINCIPAL CITIES

This HYDRAULIC POWER UNIT CAN WORK FOR YOU IN A MULTITUDE OF APPLICATIONS!



. . . it is the LeMaire TWIN RAM which can be utilized in making your own special purpose machines for drilling, boring, reaming, etc.

Being self-contained, the TWIN RAM lends itself to an exceptionally wide range of applications, and its usefulness is not restricted—this feature means extra value. It can be mounted horizontally, vertically or at any angle, and be transferred from one base to another as requirements dictate.

It can thus be one of your most valuable pieces of equipment.

Uniform pressure behind the load is always in a straight line—the two rams prevent twisting action.

Send for new complete catalog.

LeMaire

Builders of unit and way type machines for single or multiple spindle drilling, boring, reaming, tapping, etc. — twin ram hydraulic units — match-it gear chucks.

LeMAIRE TOOL & MFG. CO., 2657 So. Telegraph Rd., Dearborn, Mich.

MORSE

Single Source Service

MORSE Service applies to a *complete* line of cutting tools. This single source of supply not only simplifies purchase and maintenance of tool stocks, it also assures continuing deliveries of tools in which high quality is constant. Supporting services are the job-side cooperation of Field Representatives and, when required, the cooperation of our Physical, Chemical and Engineering Laboratories. Standardize on Morse Cutting Tools and save yourself time, trouble and money!

MORSE THERE IS A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

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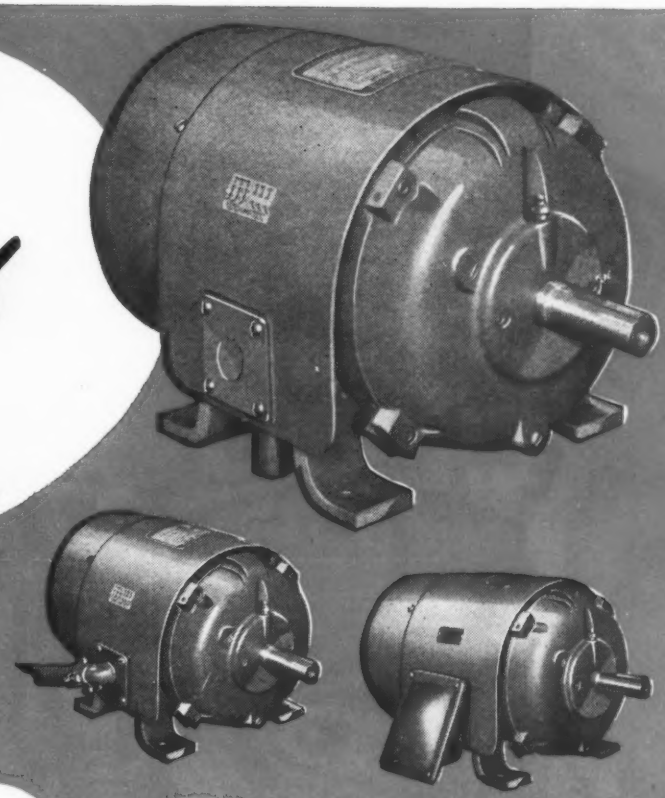
NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

SAN FRANCISCO STORE: 1180 FOLSOM ST.

Eliminate Conduit Box

OR USE ANY WAY YOU CHOOSE..



Reliance Series C Motors

ACCOMMODATE ANY MOUNTING!

Why let a motor dictate its "terms of installation". Specify Reliance Series C Alternating Current Motors and you can quickly make wiring connections to suit any type of machine mounting. Just see what you can do:

Completely eliminate external conduit box by tucking 220/440 leads into internal conduit box through either of two lead outlet arrangements

...or rotate external conduit box to any of *four different* positions

...or move box to opposite standard simply by removing rotor and turning stator 180 degrees.

Now—before you buy another motor—write or call your nearest Reliance office for complete information on this and the many other important advantages of these precision built Reliance Motors.

RELIANCE ELECTRIC & ENGINEERING CO.

1077 IVANHOE ROAD **CLEVELAND 10, OHIO**

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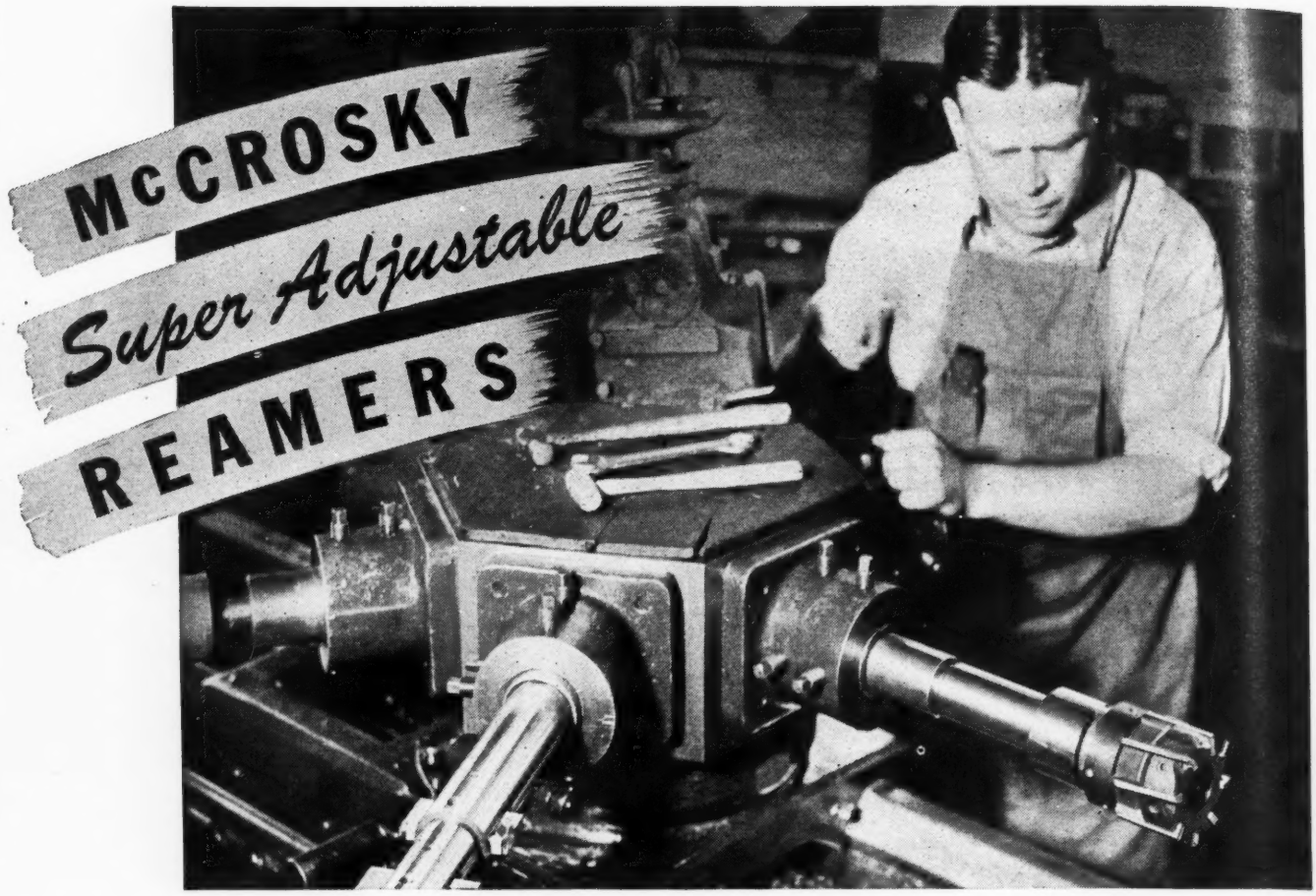
CHECK THESE 8 Balanced Design Features

1. **Protecting enclosures** keep out dirt, chips, oil, excess moisture.
2. **Steel stators for strength.**
3. **Thirteen-step winding treatment,** for maximum stator protection.
4. **Pressure cast aluminum rotors** provide trouble-free windings.
5. **Heavy shafts,** liberally designed for added strength.
6. **Improved bearing lubrication** affords real protection to bearings and windings.
7. **Optional lead outlet arrangement** permits machine mounting with elimination of conduit box.
8. **Flange and face type brackets** offer alternative methods of machine application.

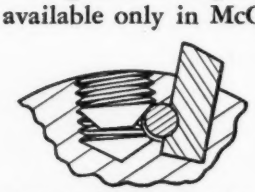
RELIANCE A-C D-C MOTORS



for Fast Dependable Operation

For increased production—of a better product—at lower cost—specify McCrosky Super Adjustable Reamers. They combine the rigidity needed for heavy duty turret lathe work, utmost accuracy, and McCrosky's service-proved pin and screw locking device.

Originated and perfected by McCrosky, and available only in McCrosky Reamers, this pin and screw lock holds the blades securely in the slot even when in fully extended position,—without restricting the clearance for chips and lubricant. It permits blades to be released easily, and adjusted uniformly and accurately. Consequently, McCrosky Reamers can be reground with minimum loss of blade stock—a particular advantage when carbide tips are used—and a minimum number of tools are needed, to keep a job in continuous operation.



Sectional View Showing Bearing Screw and Pin That Hold the Blade Rigidly Against the Reamer Body.

McCrosky Super Adjustable Reamers are furnished with straight or tapered shanks—or in shell design for mounting on arbors or line bars. High speed, cast alloy or carbide tipped blades. Standard sizes to 6″ in diameter,—other sizes, and multiple operation tools that combine related facing, boring and reaming operations—do them all simultaneously in just one operation—furnished on special order. Write for fully descriptive bulletins.

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

Designers and Manufacturers of

Jack-Lock MILLING CUTTERS — *Block Type* BORING BARS

Wizard CHUCKS AND COLLETS

Super Adjustable REAMERS — *Turret* TOOL POSTS

BATH PRECISION GAGES

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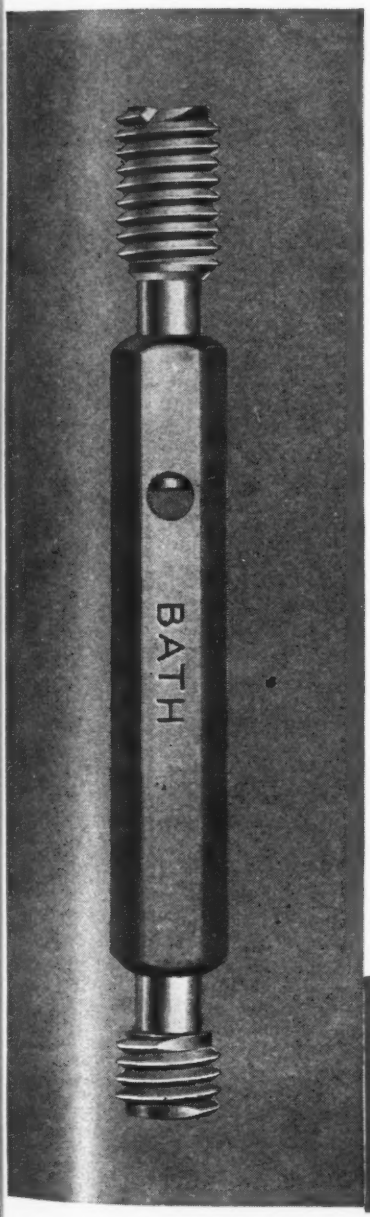
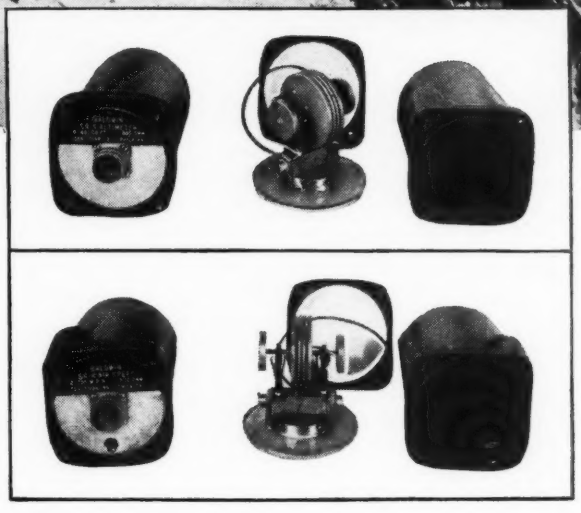
RECONVERSION PROGRAM!



MADE BY THE PRODUCERS OF BATH TAPS

JOHN BATH AND COMPANY, INC.

WORCESTER, MASS.



Pilots find the answers to these questions with the aid of the altimeter and the air speed indicator. The heart of both instruments is the Baldwin SR-4 Strain Gage. These are only two of the many applications of the SR-4 Strain Gage.

About one-half the size of a paper clip, these gages can be cemented into place wherever you can reach on any structure.

Unit strains are measurable to values smaller than that of a wave length of visible light. (0.000016 in. If this length were expanded to 1 in., an inch would be a mile long.)

Write for Bulletin 179. The Baldwin Locomotive Works, Baldwin Southwark Division, Philadelphia 42, Pa. Offices: Philadelphia, New York, Boston, Chicago, Detroit, Cleveland, St. Louis, San Francisco, Washington, Houston, Pittsburgh.

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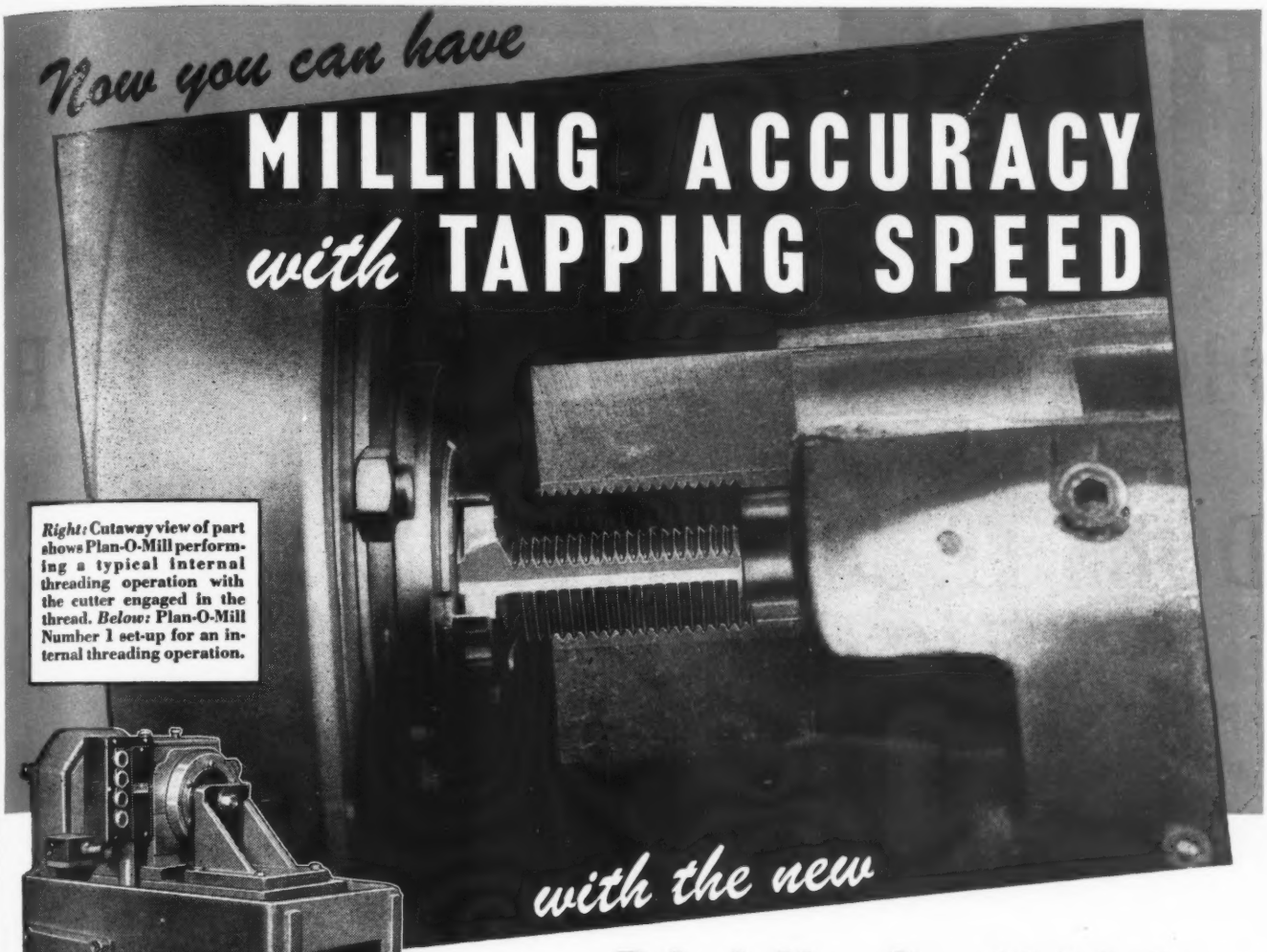
BALDWIN

SOUTHWARK

TESTING EQUIPMENT

Now you can have

MILLING ACCURACY *with* TAPPING SPEED



Right: Cutaway view of part shows Plan-O-Mill performing a typical internal threading operation with the cutter engaged in the thread. *Below:* Plan-O-Mill Number 1 set-up for an internal threading operation.

with the new

PLAN-O-MILL
NUMBER 1

You get both milling accuracy and tapping speed in the new Plan-O-Mill Number 1.

MILLING ACCURACY because the part does not revolve, and because of Plan-O-Mill's exclusive electronic feed control. TAPPING SPEED because this machine mills a complete thread—internal or external—in one revolution, provides a complete part in as little as 8 seconds! Blind holes are no obstacle. Set-up is simple. Operation is at the push of a button.

Plan-O-Mill Number 1 provides all these production advantages—*plus* cylindrical form milling—in a compact space-saving size requiring less than 9 square feet of floor! Let Plan-O-Mill help *you* lower unit costs by saving time, materials, tools, space and manpower. Write today for data sheet and floor plan, or contact your machinery dealer.

5 FIRSTS BY PLAN-O-MILL

- **First to install General Electric's remarkable new Thy-mo-trol electronic feed control!**
- **First planetary to mill external threads with standard multiple thread cutter!**
- **First planetary to coordinate feeds and speeds!**
- **First to provide absolute control of feed-in!**
- **First to offer a practical, low cost carbide thread milling cutter!**

PLAN-O-MILL CORPORATION
1511 E. EIGHT MILE ROAD
HAZEL PARK, MICH.

THREAD AND FORM PLAN-O-MILL MILLING MACHINES

THREAD AND FORM PLAN-ED MILLING CUTTERS

RUST COSTS INDUSTRY

$100,000,000 ____ HOW MUCH DOES IT COST YOU?

Answer $_____

It would be well worth your while to fill in the answer . . . **because that's exactly how much we believe we can save you.**

Two Cities Service products, Rust Remover and Anti-Corrode, in grades for every specific industrial need, have quickly and effectively helped many companies eliminate this liability.

Cities Service RUST REMOVER clears metals of rust or tarnish. Works quickly —easy to apply.

Cities Service ANTI-CORRODE *prevents* rust, provides an impenetrable film that protects metals against rust or corrosion.

• • •

Talk it over with your local Cities Service engineer . . . see for yourself what his rust prevention plan can do for you or . . .

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Room 500, 70 Pine Street, New York 5, New York

Gentlemen: Please send me full information on Cities Service Rust Prevention Plan.

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Company .....

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CITIES SERVICE OILS
ONCE-ALWAYS

It's "quick-change"
THE BLOCK
THE BAR
AND THE SPRING CLIPS
SLIP BLOCK IN BAR
TO REMOVE BLOCK INSERT SCREWDRIVER IN CLIP OPENINGS AND PRY UPWARD
AND BLOCK WILL SLIDE OUT OF BAR
SLIGHT CLOCKWISE MOVEMENT ENGAGES BLOCK
HERE
AND HERE
AND IT IS CENTRALIZED ON THE BAR SECURED IN PLACE BY SPRING CLIPS
THE GAIRING
BLOCK-TYPE BORING TOOL
Designed for Production on Rough Boring, Semi-Finishing and Reaming Operations
This quick detachable cutter block provides self-centering, positive locking, quick inserting of block in boring bar and easy removal, without the aid of locating holes or screws, keys, wedges or taper pins
The block containing the fully adjustable blades is simplicity itself. Made to engage both sides of the precision ground flats on the bar it quickly and accurately centers itself. When located, the cutting thrust ure is evenly distributed against the back and bottom of the slot ew tool combines quick change, positive drive and accuracy idity is assured because the bar is free from centralizing
er blocks are furnished fitted with High Speed Steel y or Tungsten Carbide tipped blades can be sup- All cutter blocks are heat treated for toughness, nce to chip abrasion.
UICK-CHANGE" BLOCK WORKS
block through the slot in the bar until the pro- e the ground flats on the bar. It is then perfectly n spring clips which hold the block in place and the unit from dirt, chips, etc. To remove Block flip engage the contact surfaces and withdraw the block.
NEWS FLASH

An eight-page brochure illustrating and describing Gairing's new Block-type Boring Bar is now ready for distribution. It contains information never before available.

The money-saving simplicity of this new tool, its unique quick-change and self-centering features are fully explained in terms that anybody can understand.

Every production engineer in the metal working industry, every tool supervisor, every master mechanic should have a copy of this book.

WRITE FOR YOURS TODAY

Every 8½" x 11" page, and there are eight of them, is chock full of usable information . . . fully illustrated . . . text is reinforced with many charts and diagrams.

THE GAIRING TOOL COMPANY
21221 HOOVER ROAD, DETROIT 32, MICH.

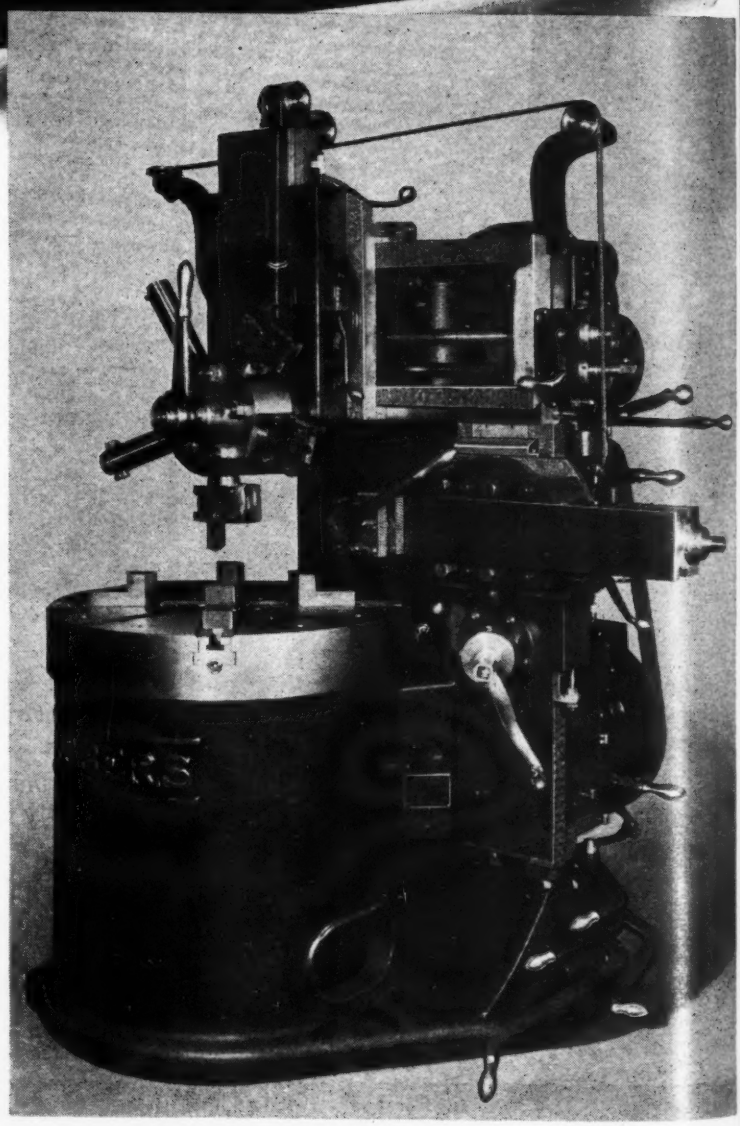
GAIRING TOOLS

DESIGNERS AND MANUFACTURERS OF STANDARD, SPECIAL AND INSERTED BLADE END CUTTING TOOLS

WARNING!

In Your Interest—We Repeat This Message

Don't Pay More for a Used Machine than for a *New* ROGERS "*Perfect 36*" VERTICAL TURRET MILL



• With new Rogers Mills you will not inherit anyone else's headaches. In many cases, new Rogers Mills have a lower initial cost than similar used machines. You are further assured of accurate performance and finished work by Rogers factory guarantee of full operating satisfaction.

New versatile Rogers "Perfect 36" Vertical Turret Mills pay for themselves on the production line and in maintenance departments with—

LOW PRODUCTION COSTS
LOW OPERATING COSTS
LOW INITIAL COST
OVER 60 YEARS OF DEVELOPMENTS AND ENGINEERING ACHIEVEMENTS

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— Knowing How Since 1885 —

HIGHER PRODUCTION ASSURED *with* AIR TOOLS

Naturally production increases when hand-held portable tools can be used. Even higher production is assured when the tools are air-operated. This is because **AIR TOOLS** are able to start and stop instantly.

This positive response to operator control is but *one* of their *many* advantages, but it means—that full power is available immediately—that there is no overspin when the tool is shut off—that spotting the next operation is quickly and easily done—that air tools are safer. Briefly it means that production, and especially repetitive operations, can be greatly speeded up with Air Tools.

Ingersoll-Rand

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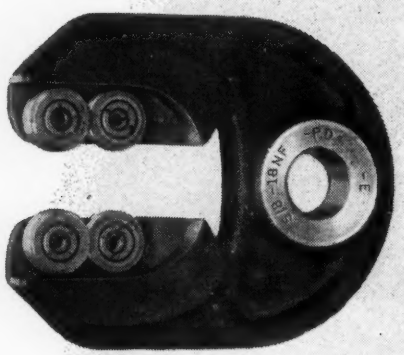
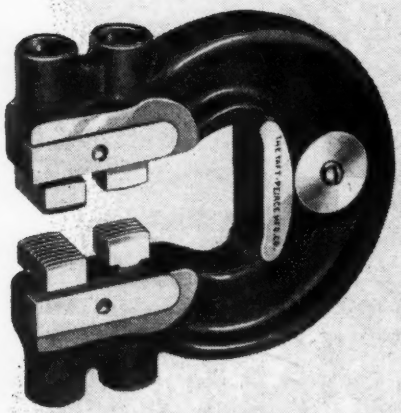
Prompt Delivery NOW... of these TAFT-PEIRCE THREAD GAGES

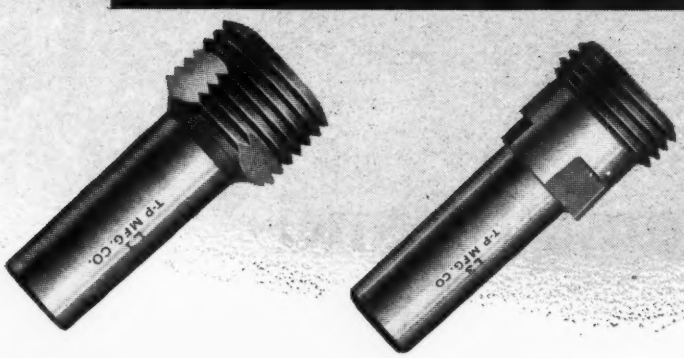
You can get prompt delivery of Taft-Peirce Thread Plug, Snap, and Ring Gages. These include all types and the Taper Pipe Thread and Plain Taper Gages made to Army-Navy Aeronautical specifications. Also available are the Taft-Peirce Snap Thread Gages which permit the greatest rapidity, consistent with accuracy, in checking work on the production line and in the inspection department.

All Taft-Peirce Gages are made to plus-precision standards in the modern plant of the Small Tool & Gage Division — made to give *you* the greatest amount of work measured per dollar of your gage investment. Order the gages you need right now — write or wire today to: The Taft-Peirce Mfg. Co., Woonsocket, R. I.

Use Taft-Peirce Gages for Every Gaging Need

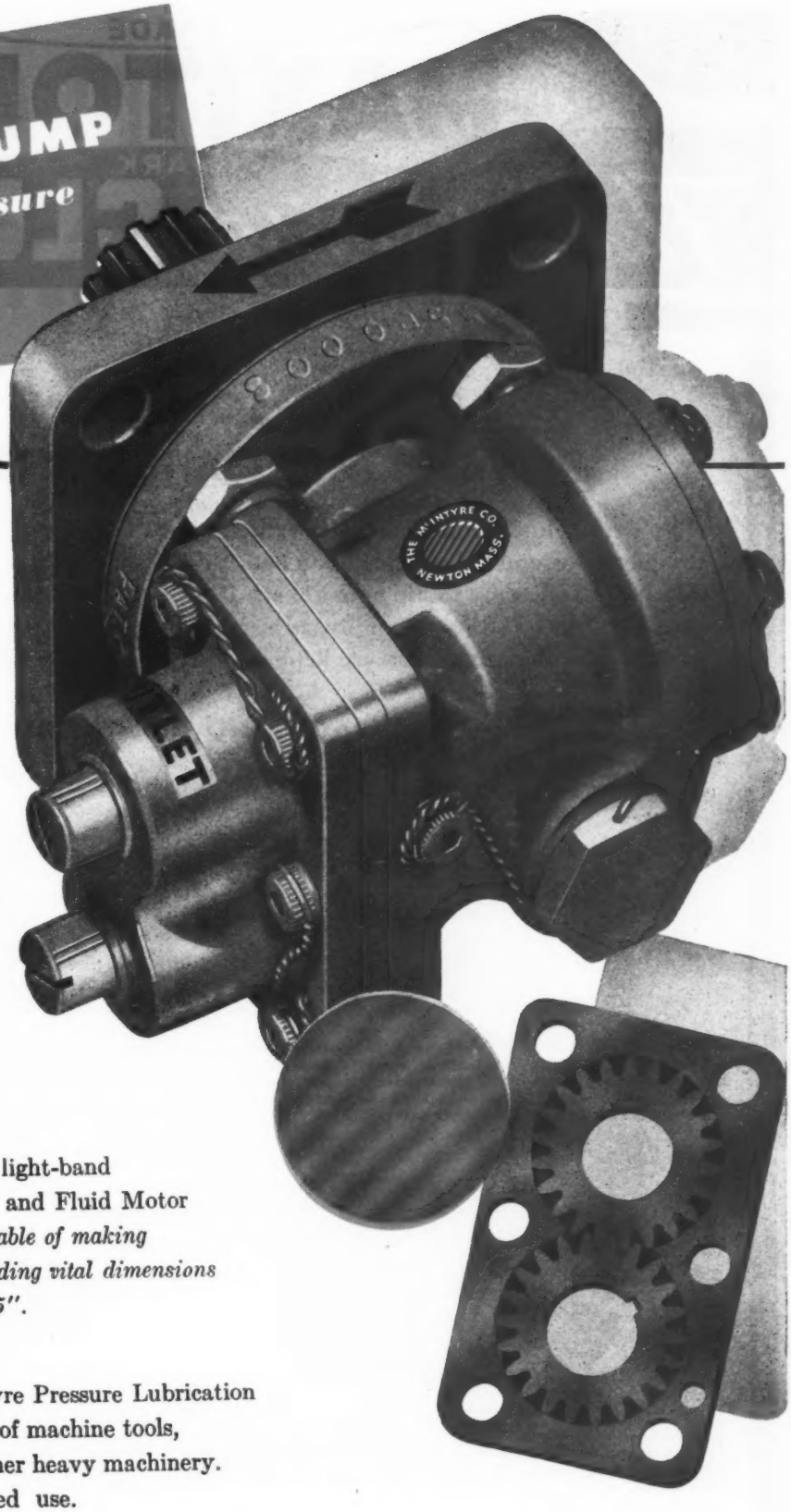






THIS TINY PUMP

Simplifies pressure lubrication



WHAT IT DOES

This McIntyre *Precision* gear-type pump. . . smaller than your fist . . . delivers 1¼ to 20 quarts of lubricating oil per hour at 3000 RPM at all normal working pressures. Early orders will be promptly shipped.

HOW IT DOES IT

Built-in reduction gearing plus easily-changed center plates and spur gears of various widths determine the capacity. Choice of AND 10,000 or 10,001 mounting pads.
Easy to mount . . . easy to drive with standard spline-drive shaft.

WHY IT DOES IT

McIntyre *Precision*—identified by the light-band trade-mark on every McIntyre Pump and Fluid Motor —results from machining methods *capable of making surfaces flat to one light band . . . of holding vital dimensions to a plus or minus tolerance of .000025".*

GET ALL THE FACTS

Technical folder describes how McIntyre Pressure Lubrication Pumps simplify protection of bearings of machine tools, Diesel engines, printing presses and other heavy machinery. Write for your copy, outlining intended use.
The McIntyre Co., 15 Riverdale Avenue, Newton 58, Mass.

THE McINTYRE CO.
(FORMERLY ZENITH ASSOCIATES)
PUMPS AND FLUID MOTORS

THE ULTIMATE IN PRECISION — *IDENTIFIED BY THE LIGHT BAND*

TRADE

MAXITORQ

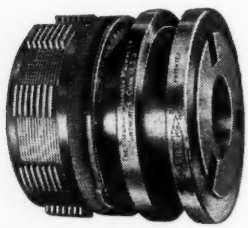
MARK

Floating Disc CLUTCHES

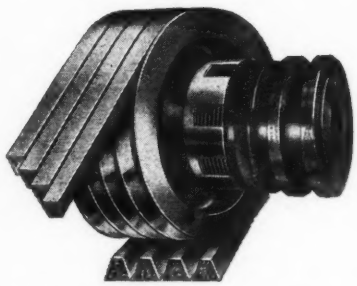
For SIMPLE SOLUTION OF *modern* POWER TRANSMISSION PROBLEMS

Here is the clutch you have long wanted . . . completely assembled on the clutch body and shipped to you ready to slip onto a shaft. It requires NO TOOLS for assembly, adjustment or take-apart. Floating Discs are kept apart in neutral by Maxitorq Separator Springs (patented) so that you can see light between them. Disengagement is fast and positive. Check the clutches shown below . . . one or several will best solve your transmission problems.

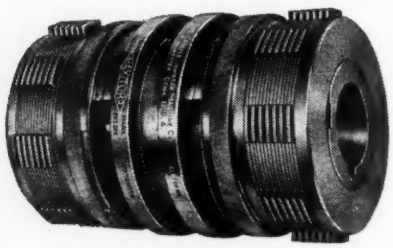
Floating Discs **NO DRAG . . . NO ABRASION . . . NO HEATING** ***in neutral***



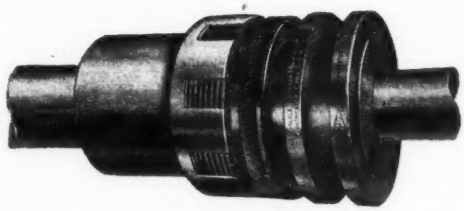
SINGLE TYPE CLUTCH used for intermittent power transmission. Widely adaptable to machine head stocks, gear boxes and V-belt, flat belt, chain drive or spur gear installations between shafting. Also in a special design, as an automatic OVERLOAD RELEASING safety device.



PULLEY TYPE CLUTCH: All Maxitorq clutches are available in V-Belt or Spur Gear Type for use on a shaft. Pulley, etc., mounted on the loose sleeve of clutch, body is keyed to shaft. Driving pulley can be immediately released or connected with the shaft.



DOUBLE TYPE CLUTCH now more frequently used as a machine control for reversing motions such as tapping attachments, feed movements of automatic machinery and for reversing main spindles in machine tools. Also as a high and low speed, or one end as a quick acting positive brake.



CUT-OFF COUPLING CLUTCH is used as a one-way cut-off coupling (single type) where motors are direct connected to machines they drive . . . motor shaft permanently keyed to one part of clutch . . . driving shaft of machine keyed to the other.

SPECIAL APPLICATIONS: Carlyle Johnson Engineers will be glad to provide assistance for the solution of power control problems, with recommendations for the best applications of Maxitorq clutches. Do not hesitate to ask for this service.

NEW CATALOG No. M11 . . . NOW AVAILABLE ON REQUEST

THE CARLYLE JOHNSON MACHINE COMPANY · MANCHESTER, CONNECTICUT

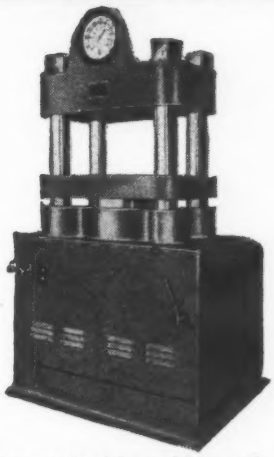
VERSATILE!

IN LABORATORY OR SHOP

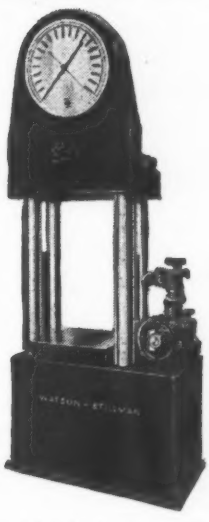
HERE ARE TWO PRESSES that have a wide range of usefulness both in your laboratories and shops. They are ideally suited for performing experiments under conditions approaching actual high production service, as testing machines for concrete testing, compression and bending tests of various materials. They are equally suitable for testing cavity molds, making samples or handling development and research work.

In your shop these presses will also speedily and efficiently handle innumerable actual production tasks such as die work, straightening, metal forming, punching and molding.

Both types are rugged, four-column, self-contained, oil operated hydraulic presses. The power equipment for the General Purpose Type Press is enclosed in a cabinet which forms the base. The power equipment for Laboratory Type Presses is a high pressure hand pump supplemented by air pressure for rapid advance of the ram. Because these presses are of four-column construction, they are far sturdier, more accurate, efficient and easier to maintain in alignment under heavy loads than equally priced presses of two-rod construction. For your press requirements you can choose from a wide range of capacities. Special controls and accessories to fit a variety of applications can be furnished. For complete data and illustrated bulletins write—The Watson-Stillman Co., Roselle, New Jersey.



Compact 4-rod General Purpose Press. Capacity: 20 to 200 tons. Platen range: 8"x 8" to 20"x 20". Double-action ram provides high-speed return to break dies or withdraw punches; convenient hand lever control at front.



This rugged 4-rod Laboratory Press provides pressures on comparatively small areas—10 to 200 ton capacity; platen range: 6"x 6" to 15"x 18"; electric or steam heated platens furnished.

WATSON-STILLMAN

Designers and Manufacturers of Hydraulic Equipment, Forged Steel Fittings and Valves

FACTORY AND MAIN OFFICE
ROSELLE, NEW JERSEY

Branch Offices: WASHINGTON, D. C. • NEW HAVEN, CONN. • PHILADELPHIA, PA. • CHICAGO, ILL. • Representatives: WASHINGTON, D. C...Ralph Payne (R. R. Equip.) • INDIANAPOLIS, IND... W. K. Millholland Machinery Co. • CHICAGO, ILL...E. L. Essley Machinery Co. • MILWAUKEE, WIS... E. L. Essley Machinery Co. • ST. PAUL, MINN...Anderson Machine Tool Co. • SAN FRANCISCO, CAL... Jenison Machinery Co. • CLEVELAND, O...The Cleveland Duplex Machinery Co. • DETROIT, MICH... Peninsular Machinery Co. • GRAND RAPIDS, MICH...E. L. Essley Machinery Co. • LOS ANGELES, CAL...Smith Booth Usher Co. • DALLAS AND HOUSTON, TEX...Perry Machinery Co. • TULSA, OKLA. ...Perry Machinery Co. • CANADA: Canadian Fairbanks-Morse Co., Ltd. • Branches in All Principal Cities.

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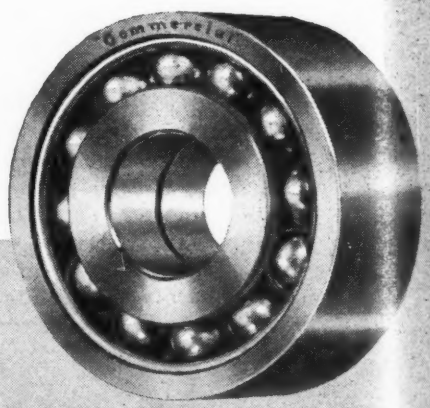
Smart buyers specify Schatz "Commercial" ball bearings,— the short-cut to manufacturing economy. "Commercial" ball bearings are sturdy, efficient and moderately priced.

Schatz "Commercials" are available in all types and sizes and, if you have a difficult installation, Schatz will make special ball bearings exactly suited to your needs.

SCHATZ "Commercial" BALL BEARINGS

FOR DEPENDABLE BALL BEARING SERVICE, USE SCHATZ "COMMERCIALS" IN YOUR PLANT OR PRODUCT.



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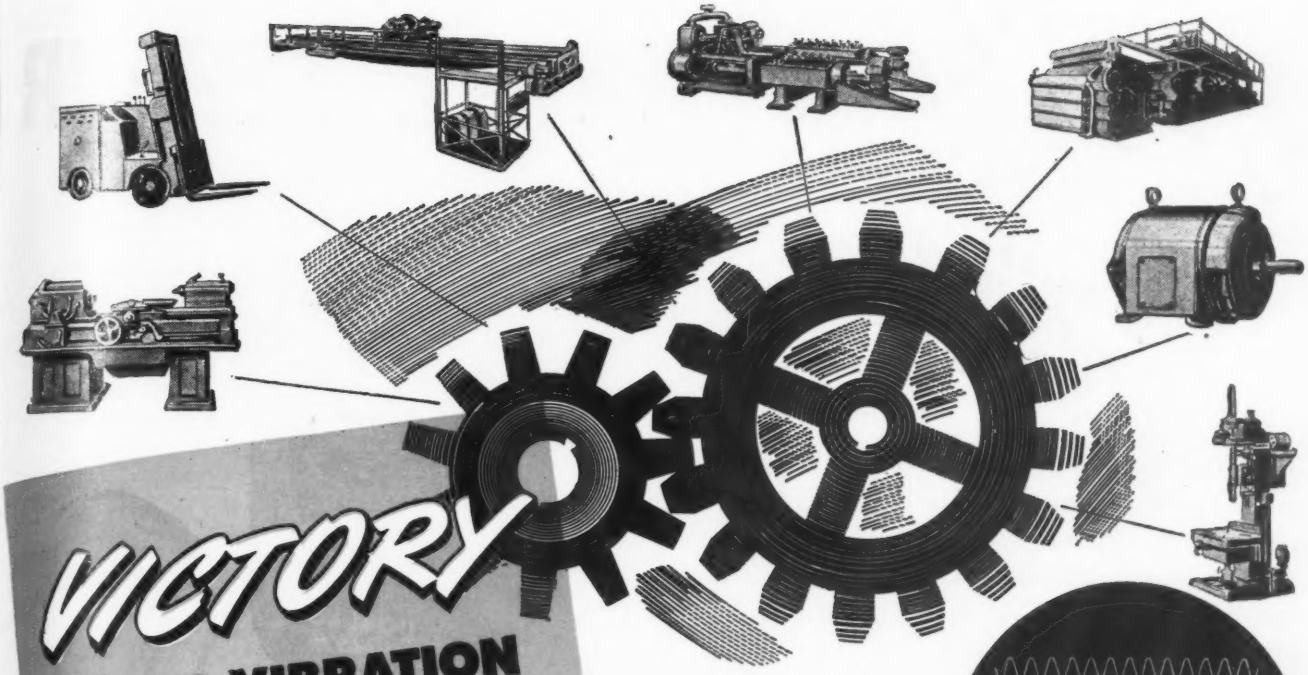


VICTORY OVER VIBRATION *In Industry*

LORD
SHEAR TYPE
Bonded Rubber
MOUNTINGS

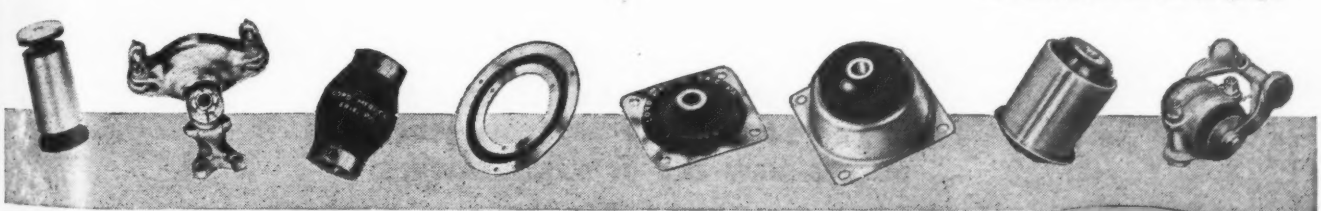
MAN'S struggle for speed and more speed, in travel and in production, is largely a struggle to combat the interfering and disrupting forces of vibration. Man has no practicable method for the *elimination* of vibration, but he can do much to *control* and *isolate* its harmful effects.

By flexible suspension of the entire machine, equipment life is prolonged by reducing metal fatigue; production is increased, its quality improved, through smoother operation; nervous strain on operators and other workers is greatly reduced. Also material is saved by eliminating base weight used for inertia mass. Other savings in production costs and improvements in efficiency of personnel are attained by separate mountings for motors, gauges, and tools. Lord Mountings combat the destructive forces of vibration as effectively as scientific lubrication combats the wearing effect of friction.

Lord is the Pioneer and leader in the science of vibration control and isolation thru the application of natural and synthetic rubber. Lord Shear Type Mountings and other Bonded Rubber Products are the embodiment of many exclusive techniques and patented features developed through years of research and practical application.

To help you select the proper Lord Mounting for your specific objective, or to design it for you, Lord engineers are at your service.

Every genuine Lord Mounting carries the name "LORD" embossed in the rubber or in raised letters on the forgings.



IT TAKES **BONDED RUBBER** *In Shear* TO ABSORB VIBRATION

LORD MANUFACTURING COMPANY
ERIE, PENNSYLVANIA

★ BUY VICTORY BONDS ★

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RAILWAY & POWER ENGINEERING CORP., LTD.
TORONTO, CANADA

Originators of Shear Type Bonded Rubber Mountings

NEW! 16" DoALL ZEPHYR

for PLASTICS WOOD HARD BOARDS NON-FERROUS METALS & ALLOYS

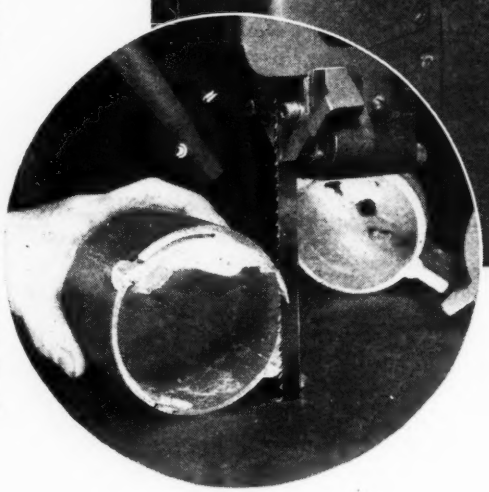
This versatile 16" Zephyr will take work up to 10" thick and cuts at any speed from 1000 to 5000 f. p. m. Meets the demand for greater speed in a compact housing — 6-1/2 ft. high, weighs 1150 pounds, and requires 33" x 41" floor space.

MAKES EVERY SECOND PAY

Operator consults Job Selector for proper saw and speed for the material he has to cut. He installs saw in a few seconds, adjusts fingertip speed control to specified speed and is off to a flying start.

ADVANCED FEATURES

Infinitely Variable Speed – Speed Indicator – Chip Blower – 4-way Tilt Table – 2 H. P. Motor – Other exclusive features make DoALL safe and easy to operate efficiently.



A demonstration can easily be arranged through the DoALL Supply Store nearest you—or, write for new catalog.

For high-speed cutting, use DoALL Buttress Blades

BIG BROTHER OF THE 16" ZEPHYR, IS THE 36" ZEPHYR – BOTH INTRODUCE A NEW ERA IN BAND SAWING.

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Boston	ASP 6669	Detroit	TE 2-3060								
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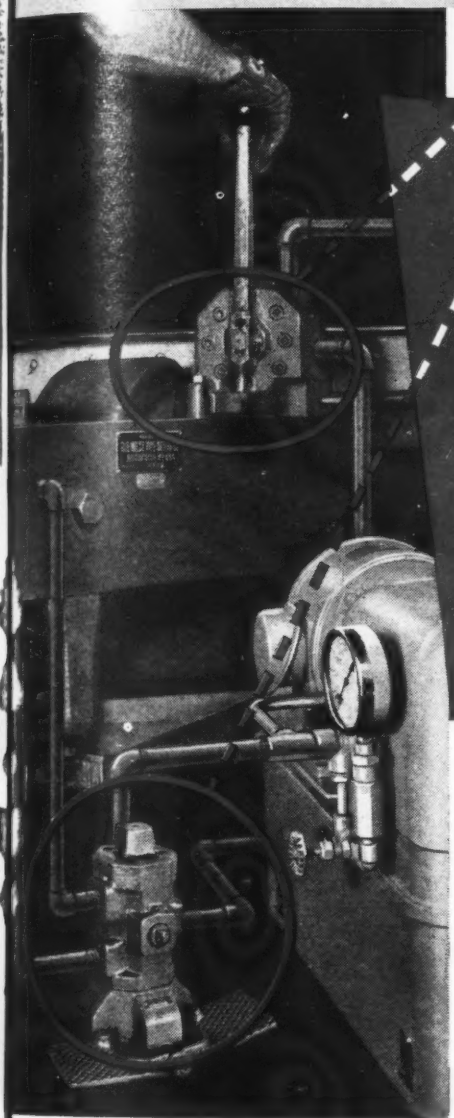
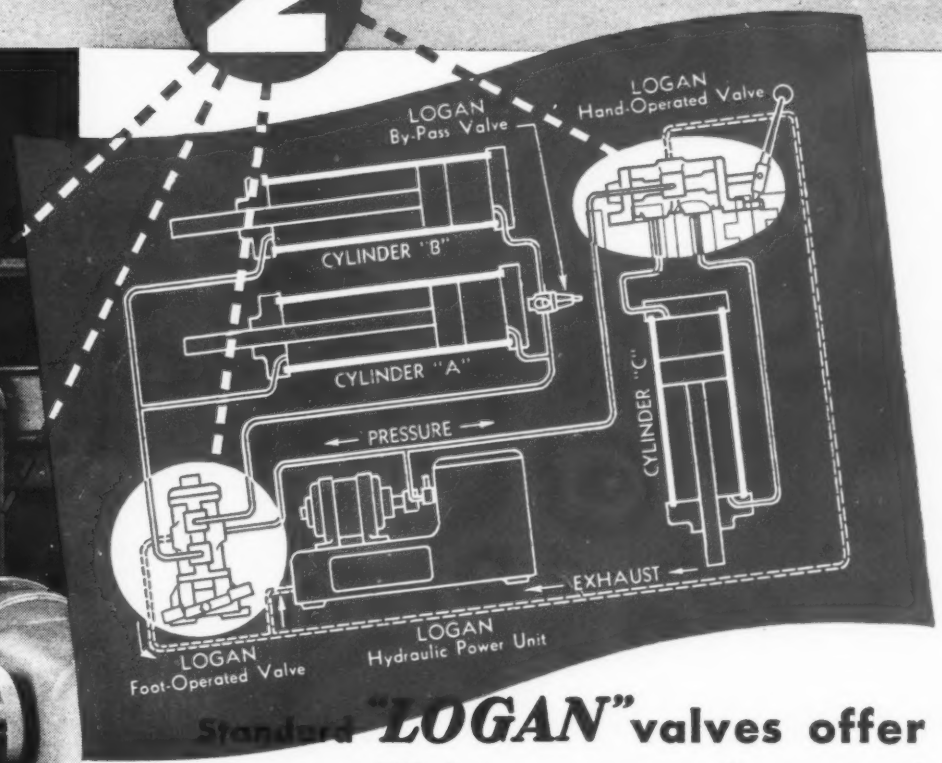
San Francisco	GA 4784						

6 HYDRAULIC MOVEMENTS CONTROLLED BY 2 STANDARD VALVES

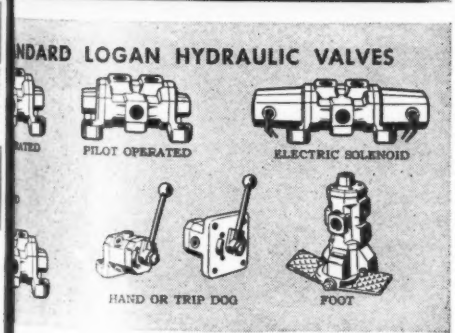




Standard "LOGAN" valves offer the most efficient type of control for every hydraulic application

Two double-acting hydraulic cylinders operating in sequence are controlled by a single Logan foot-operated hydraulic valve in this application. Pressing one treadle directs oil to the blind end of both cylinders; a Logan by-pass valve regulates Cylinder "A" to its outstroke, after which Cylinder "B" starts operation. Pressing the other treadle directs full line pressure to the rod end of both cylinders. The hand-operated Logan hydraulic valve controls a third double-acting cylinder (Cylinder "C") used for a pressing operation.

Standard Logan hydraulic valves permit manual or foot, remote, semi-automatic, automatic, time delayed, interlocking and sequence control of single and double-acting cylinders. Hand-operated valves are available for *oil service* in plain, latching, spring return and open center types; for *water service* in plain and spring return types. Other 4-way control valves include foot, electric solenoid, cam-operated and pilot-operated models. The pilot-operated valves are furnished for either air or hydraulic operating valves. A complete line of relief, reducing, by-pass and speed control valves is also available.



ENGINEERING HELP

Refer your hydraulic circuit problems to Logan engineers for careful analysis and recommendations. Layouts furnished. No obligation for this service.

FREE LITERATURE

Get your copy of Catalog 80, Section 3 on Logan hydraulic control valves. Also ask for literature on Logan cylinders and hydraulic power units.

Logan SAVES ★TIME ★EFFORT ★MOTION

Air and Hydraulic Equipment

LOGANSPORT MACHINE CO., INC.

910 CENTER AVE.
LOGANSPORT
INDIANA

CHUCKS • CYLINDERS • VALVES • PRESSES • SURE-FLOW COOLANT PUMPS

EXCELLENCE OF THE PRODUCT REFLECTS EXCELLENCE OF THE PROCESS

Product

MADISON-KIPP LUBRICATORS

Madison - Kipp Lubricators provide the most dependable method of lubrication ever developed. There are six popular models for every application. Illustrated is the Model SVH 5 feed, right hand, end ratchet drive, suitable for service pressures up to one thousand pounds. Madison-Kipp specializes in lubricators for original Standard equipment. Write for special engineering data for your particular requirement.

Fresh Oil

FED UNDER PRESSURE BY THE MEASURED DROP

MADISON-KIPP DIE CASTINGS

This casting forms the body of the sight feed shown above on the Model SVH Madison-Kipp Lubricator. The Madison - Kipp Die Casting Process offers the product designer almost unlimited opportunities to add pleasing appearance, light weight and improved strength at an over-all cost saving. Address all inquiries to our offices at Madison, Wisconsin.

Process

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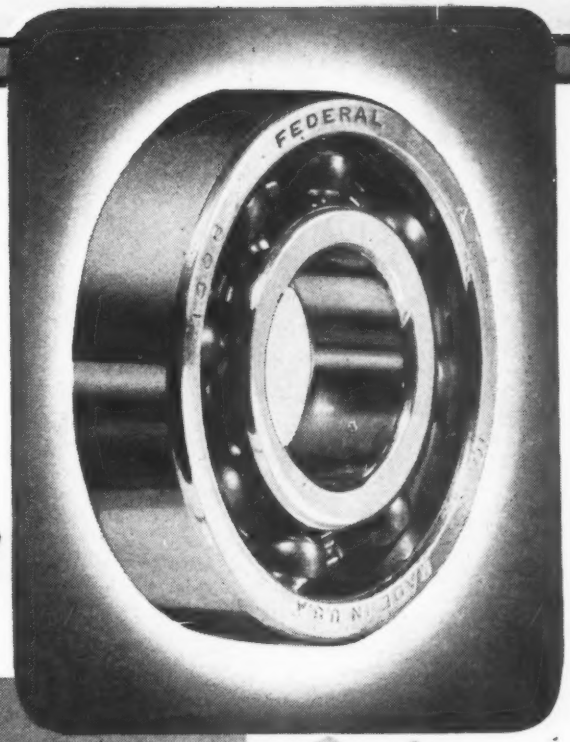
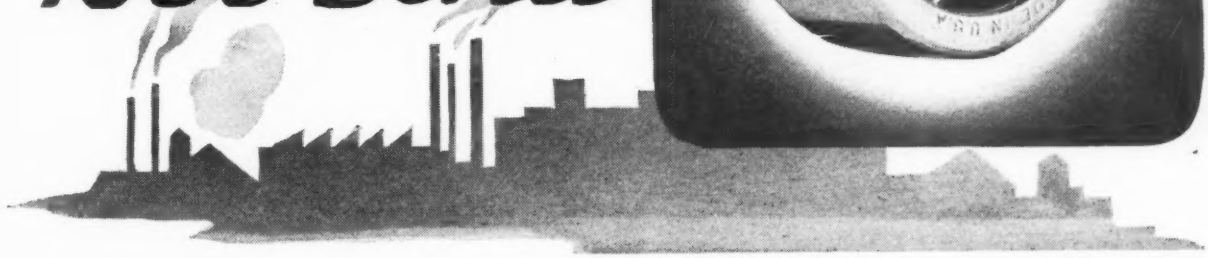
Wm. Coulthard & Son Ltd. Carlisle

THE FEDERAL 1300 Series





DOES A BIG JOB IN MANY DIFFERENT INDUSTRIES

One of the outstanding characteristics of Federal 1300 Series is adaptability to many different products. These bearings are used in fractional horse-power motors, fine machine tools and in the transmissions of motor cars and trucks. Federal 1300 Series long ago gained the endorsement of engineers and designers in various industries. During the war, these precision ball bearings served our armed forces on every battlefront. Today, true to Federal tradition, 1300 Series is doing a big job in post-war production.

If you seek medium-sized ball bearings of the same high Quality,—use Federal 1300 Series in your plant, or product.

FEDERAL
BALL BEARINGS

THE JEWELS OF INDUSTRY

THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT

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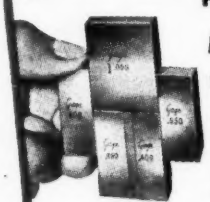
by *Cold Treating* in a *Deepfreeze* Industrial CHILLING MACHINE!

HERE'S A TESTED COLD-TREATING PROCEDURE...



A Simple Treatment that Saves this Manufacturer Time and Money in the Stabilization of Gauge Blocks, Lapping Flats, etc.

1. Heat treat as usual.
2. Subject to sub-zero temperatures in Deepfreeze −120° F. Industrial Chilling Machine for period of six hours.
3. Remove and let return to room temperature.
4. Hold at room temperature for period of six hours.
5. Repeat cycle six times.

Result–Transformation of Austenite into Martensite complete; cause of distortion eliminated in fraction of time required by traditional age hardening method.

Drilling and Tapping Operations Completed Without Tearing... Machining Done Without Distortion

Cold treating solved a difficult production problem in the manufacture of hydraulic valves for aircraft. Prior to its adoption, the manufacturing process was slow and costly. It was common to have valves tear while being drilled and tapped. Distortion was excessive as a result of general machining operations.

Cold treating was recommended as a means of remedying this troublesome situation. A Deepfreeze Chilling Unit was used and the valves subjected, in accordance with a simple procedure, to sub-zero temperatures of −120° F. Results were outstanding. The cold treated valves could be drilled and tapped without tearing and original dimensions were consistently held after machining.

Today this manufacturer has these valves cold treated in a Deepfreeze unit before doing any work on them. As a consequence valve production has been greatly increased, quality improved and production costs considerably lowered.

Cold Treating Aids Industry in Many Ways...

This is just one instance of the industrial value of cold treating. The result, however, is typical of those being attained by many industrial organizations throughout the country, who are applying it for such purposes as metal hardening, stabilization, shrink-fit assembly, testing, etc. For information on how to apply cold treating to your production, contact Deepfreeze Engineering Service. Deepfreeze engineers will be glad to make recommendations and actually cold treat sample parts and inform you of the results you can expect. This service will not obligate you in any way.

FREE! Valuable Production Help...

Here's cold treating information that you can use to advantage on your production line. This 48-page booklet is filled with outstanding performance data stories which can possibly be duplicated in your plant... with the most successful cold treating procedures in use today... and with one hundred and one additional cold treating facts that you can use to improve your production. Send for your free copy today.

Only Motor Products can make the "DEEPFREEZE"

Deepfreeze

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Our 3 POINT POLICY

Insures Lower Production Costs for YOU

QUALITY *Precision Built*

DIES · FIXTURES · JIGS · GAGES *are*

1. *Engineered for maximum production capacity*
2. *Built Right*
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Our customers like this 3 Point Policy. It keeps production costs down—helps keep them "in line." ★ Every tool we design and build must measure up to this yardstick. If you need tools to get work out F-A-S-T and without interruption, drop us a line TODAY!

QUALITY TOOL & DIE CO.

Manufacturers of "Quality" Products

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He was always "4-FOOTED FRED"

...always down on all fours, trying to find those slithery slotted screws that skid off the driver and roll out of sight. Fred lost hours this way—as well as scores of screws —

...until AMERICAN PHILLIPS SCREWS put him back on his feet—*and kept him there*

Every time Fred fits an American Phillips Screw on the 4-winged bit of his power driver—he's a sure shot to make a swift, straight, secure fastening. For these recessed-head screws *stay aligned* with the driver till the heads are turned up flush. There's no open-end slot to let the driver skid out... instead, a 4-winged recess that encloses the driver completely, and holds it secure in a *tapered* grip.

So no time is lost in hunting for dropped screws... and none lost in slow starts, "drunken driving," or filing mangled screwheads. For American Phillips Screws drive straight every time, and their heads can't burr or split. This means total time-savings up to 50%—*which means that American Phillips Screws COST LEAST on any assembly job.*

Make a note, now, to mark your orders: "*American* Phillips Screws." For then you get the extra value-protection of American's 4 inspections, and automatic weigh-count... plus prompt delivery from ample American warehouse stocks.

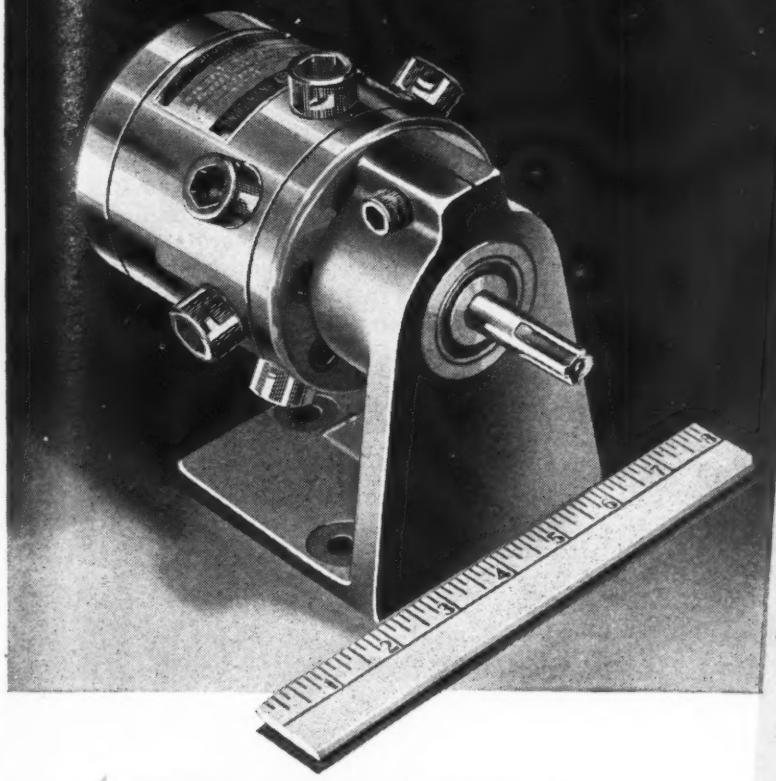
AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

Chicago 11: 589 E. Illinois Street *Detroit 2:* 502 Stephenson Building

AMERICAN PHILLIPS *Screws*

Guaranteed Free from Burrs and Split Heads

SECO FLUID POWER PUMPS WILL IMPROVE YOUR HYDRAULIC SYSTEM



Revolutionary Design

enables these small, fixed displacement hydraulic pumps to generate pressures up to

10,000 P.S.I.

The pressure is generated within

Hollow Pistons

The higher the pressure the tighter the seal between the moving piston, cylinder sleeve, and pump body. Due to this inherent sealing quality of the *Hollow Pistons*, the higher the pressure the greater the overall mechanical efficiency.

- **LOWER MAINTENANCE**
- **LONGER LIFE**
- **HIGHER PRESSURE**
- **SMALLER UNITS · SMALLER LINES · SMALLER RESERVOIR**

SECO radial hydraulic pumps are built to generate, and stand up under, extremely high pressures — higher, possibly, than you now use. But the fact that they operate efficiently at higher pressures means that at lower pressures they simply loaf — as far as stress and wear are concerned. And by utilizing higher pressures you can use smaller, more compact actuating cylinders, smaller lines, a smaller oil reservoir — all making for cleaner, more compact design.

MODELS: Seco pumps are at present being built in four models. No. 20 LAH (illustrated) which delivers ½ G.P.M. at 10,000 P.S.I. Identical in size and appearance but of slightly greater displacement is 20 LAL which delivers 1¼ G.P.M. at 3,000 P.S.I. Model 80 LAH is a larger pump delivering 1¾ G.P.M. at 10,000 P.S.I., and Model 80 LAL with greater displacement, delivers 5 G.P.M. at 3,000 P.S.I. All models reach rated capacity at 1750 R.P.M.

INQUIRIES ARE INVITED from manufacturers who use fluid power pumps in quantity. Single pumps for replacement are also available in all four models. Write for Bulletin LA.

SIMPLEX ENGINEERING COMPANY

MANUFACTURERS OF THE **SECO** HYDRAULIC CLOSER NOW ALMOST UNIVERSALLY USED ON FILTER PRESSES OF ALL MAKES.

ZANESVILLE 18, OHIO

FOR *Fast* CUTTING IN *Tough* MATERIAL

MERCURY

TWIST DRILLS

THESE drills have flutes of a faster spiral, well rounded, highly finished chip chutes, extra heavy webs, and margins of extreme hardness and smoothness.

Now available in wire gauge: — No. 1 to 60 inc., Letter sizes: — A to Z, Fractional sizes: — up to and including 3 9/64" with straight and taper shanks.

★ ★ ★

TWIST DRILLS . . . CENTER DRILLS . . . REAMERS . . . COUNTERBORES . . . END MILLS . . . BEARING-IZING TOOLS . . . GEAR TOOTH ROUNDING CUTTERS . . . AEROMATIC DRIVES . . . and COUNTERSINKS.

Send for Catalog

COGSDILL TWIST DRILL CO.

12960 WEST EIGHT MILE ROAD
BOX 97, COLLEGE PARK STATION
DETROIT 21 MICHIGAN

REX-WELD

KING OF FLEXIBLE METAL HOSE!

● There are reasons for leadership in every line. Better performance, finer quality, greater versatility and dependability . . . these and many more have given REX-WELD Flexible Metal Hose the high reputation it has today. A reputation that has earned the confidence of industry everywhere. Industrial men know the advantages of REX-WELD. For this rugged, seep-proof, airtight product has been out-performing ordinary connections on a wide variety of applications throughout industry.

Let "Flexon," the CMH trademark character, show you in the sketches below some of REX-WELD'S outstanding features. Then ask us to give you the full story about REX-WELD and the other flexible metal hose products in our complete line.

REX-WELD . . . Handles steam with utmost safety. It is seep-proof to gas, oil, water and searching fluids. It is highly rust-resistant and non-deteriorating.

REX-WELD . . . operates efficiently under pressures up to 5,000 p.s.i., temperatures to 1,000 degrees. Greater strength and durability are the result of its 50-50 principle of corrugation . . . of an autogenous welding process that makes the weld stronger than the tube itself.

REX-WELD . . . is available in bronze and steel in sizes from 3/16-in. to 4-in. I.D. (incl.), with annular or helical corrugations, braided or unbraided depending on requirements. REX-TITE heatproof mechanical couplings are easy to install and are reusable.

ARMY NAVY

Flexible Metal Hose for Every Industrial Use

CMH

CHICAGO METAL HOSE CORPORATION
MAYWOOD, ILLINOIS

Plants: Maywood and Elgin, Ill.

Case Histories

Specific application "A"
A pictorial explanation of the "how" and "why" of Thompson Crush Form Contour Grinders
Specific application "B"

Pictorial booklet explains THOMPSON TRUFORMING

. . . production with COMPLETELY ENGINEERED Crush Form Contour Grinders

THE fully automatic Crush Form Contour Grinder, illustrated above, is one of the (Thompson Truform) surface grinders *completely engineered* as a unit and built by the Thompson Crush Form Contour Grinding Development Laboratory to mass produce a complicated precision contour. The complete story of this application, together with the development of a semi-automatic (Thompson Truform) machine for job-lot contour production and regular surface grinding, is included in a new 16-page pictorial book, entitled "Facts About Crush Form Grinding Precision Contours." This book, the first of its kind, is a result of ten years of pioneering research and engineering by THE THOMPSON GRINDER COMPANY, SPRINGFIELD, OHIO.

COPYRIGHT 1945 BY THE THOMPSON GRINDER CO., INC.

Get these facts today!

Crush-Form-Contour-Grinding
Development Laboratory
The Thompson Grinder Company, Inc.
Dept. · Springfield, Ohio

Gentlemen: Please send me the 16-page pictorial book of facts about crush-form contour grinding on completely engineered surface grinders (the process known as Thompson Truforming).

NAME_____

POSITION_____

COMPANY_____

ADDRESS_____

CITY_____

ZONE_____ STATE_____

Diagram of positioning buttons formed on the flanges. The punch side was made larger than the die side so that the metal would not pierce.

Redesign for Stamping Cuts Housing Weight in Half

Castings formerly used for these counting device housings weighed 3 lbs. 4 oz. each. The stamped redesign is only about half of this weight. The whole job could not be stamped, so a screw machine part was attached to one half through a "D" hole. To permit assembly of an oil cup, this same half had a hole pierced in it and was then extruded to permit assembly of an oil cup. This method saved making the parts of a heavy gauge material throughout. The design was also worked out so that one set of tools made both halves. This is another example of a stamping user saving money through Presteel ingenuity. We invite you to talk over your problems of design or production with our engineers or representatives.

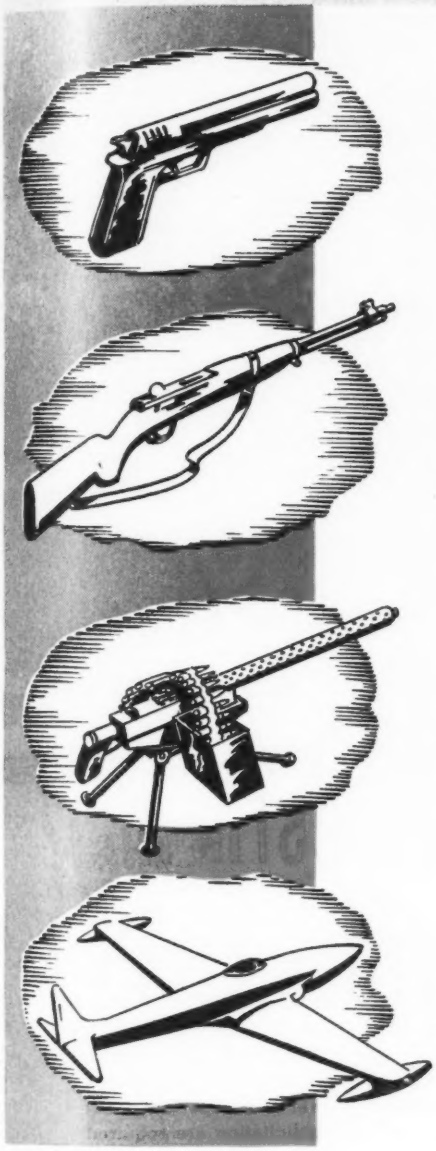
WORCESTER PRESSED STEEL CO.

311 Barber Avenue — Worcester 6, Mass.

ALLOY STEELS AND OTHER METALS COLD FASHIONED SINCE 1883

Representatives in Alexandria Virginia, Buffalo, Canton Ohio, Chicago, Denver, Detroit, Fort Worth, Indianapolis, Los Angeles, New York, Philadelphia, Syracuse, Toronto

Broaching's WAR-PROVED EFFICIENCY CAN HELP YOU NOW!



When the finishing of grooves in pistol frames was changed to broaching, one broaching machine and one operator replaced six machines and six operators . . . yet production was greatly increased. The result was faster production of a better gun at lower cost.

The engineers of one large plant producing Garand rifles figured savings at $397,623 in capital investment, $266,000 per year in wages at $1.00 per hour, 2000 square feet of floor space, plus the lessened maintenance cost of fourteen machines that did the work of 111 machines formerly used.

Machine gun barrels were changed from rifling with many passes by a single point tool to broaching in one pass. In one instance, out of nearly 19,000 barrels produced only 41 were scrapped, a reduction of 97% from average scrap loss.

The intricate "Christmas tree" that fastens the blades to the rotor in a jet engine must be accurate to the closest limits. To produce this odd and difficult shape to press fit tolerances, broaching and broaching alone was suitable.

THESE WAR-LEARNED LESSONS ALSO APPLY TO PEACE-TIME PRODUCTION

Faster Production . . . Greater Accuracy . . . Lower Costs . . . all of these things and more can be had in your peacetime production by applying the experience of Detroit Broach. Call in a Detroit Broach engineer and go over your production methods with him. He will give you complete production and cost figures on your own job. It costs nothing to get the facts. Call or write today.

DETROIT BROACH COMPANY

20201 SHERWOOD AVENUE • DETROIT, MICHIGAN
9308 SANTA MONICA BLVD. • BEVERLY HILLS, CALIFORNIA

Now—MATCH THEIR BEST WITH YOUR MOST IN THE VICTORY LOAN!

Top off your good work on your Payroll Savings Plan with an outstanding showing in the Victory Loan—our last all-out effort!

Help bring our boys back to the homes for which they fought—and give our wounded heroes the best of medical care—by backing the Victory Loan! You know your quota! You also know by past war-loan experience that your personal effort and plant solicitation are required to make your quota.

Sell the New F.D. Roosevelt Memorial $200 Bond through your PAYROLL SAVINGS PLAN!

In rallies, interdepartmental contests, and solicitations, promote the new Franklin Delano Roosevelt Memorial $200 Bond! Better than "cash in hand," Victory Bonds enable the buyers to build for the future—assure a needed nest egg for old age.

Keep on giving YOUR MOST to the Victory Loan! All Bond payroll deductions during November and December will be credited to your quota. Every Victory Bond is a "Thank You" to our battle-weary men overseas—also a definite aid in making their dreams of home come true! Get behind the Victory Loan to promote peacetime prosperity for our returning veterans, your nation, your employees--and your own industry!

The Treasury Department acknowledges with appreciation the publication of this message by

MACHINERY

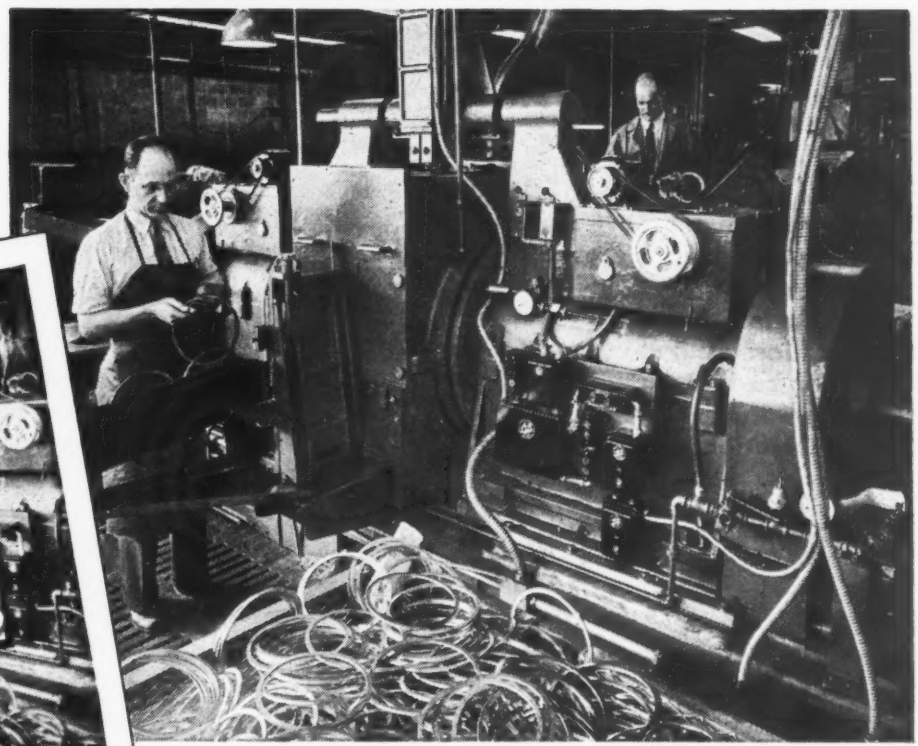
VICTORY LOAN

This is an official U. S. Treasury advertisement prepared under auspices of Treasury Department and War Advertising Council

BESLY GRINDERS *Add* sales features

to SEALED POWER PISTON RINGS

The Besly Grinder illustrated at the right, and in the ad reproduction below, is doing highly essential close-tolerance finishing in the factory of the Sealed Power Corporation, Muskegon, Michigan.



No. 1400 Besly Production Grinder

Better to serve you when peace returns
Today the largest and best facilities in over 35 years of Sealed Power history are still turning out millions of piston rings to power the engines of war. When peace comes again, those facilities will be entirely devoted to your service.
SEALED POWER CORPORATION
SEALED POWER PISTON RINGS
PISTONS—CYLINDER SLEEVES

Because of the extremely close tolerance of this 42" high production grinder which produces the exceptionally fine finishes on the sides of piston rings, Sealed Power rings are free from dish, warp and twist.

The outsanding production increases and improved product quality made possible by Besly "253-42" grinders are due in no small measure to the use of oil as a coolant *with no water added.*

Other design improvements are a more rigid grinder with the largest grinding members ever used for piston ring finishing.

Result: 1. A tremendous increase in production. 2. A finished product that meets very close limits for size, flatness and parallelism. 3. A perfection of finish formerly considered impossible by production experts.

This is typical of what Besly engineers, working in close cooperation with technical experts in mass-production industries, can accomplish. Whatever your product—if grinding operations are required—*Besly engineers will be glad to help you select the right grinder and the correct abrasive to do your work accurately and quickly—at low cost.*

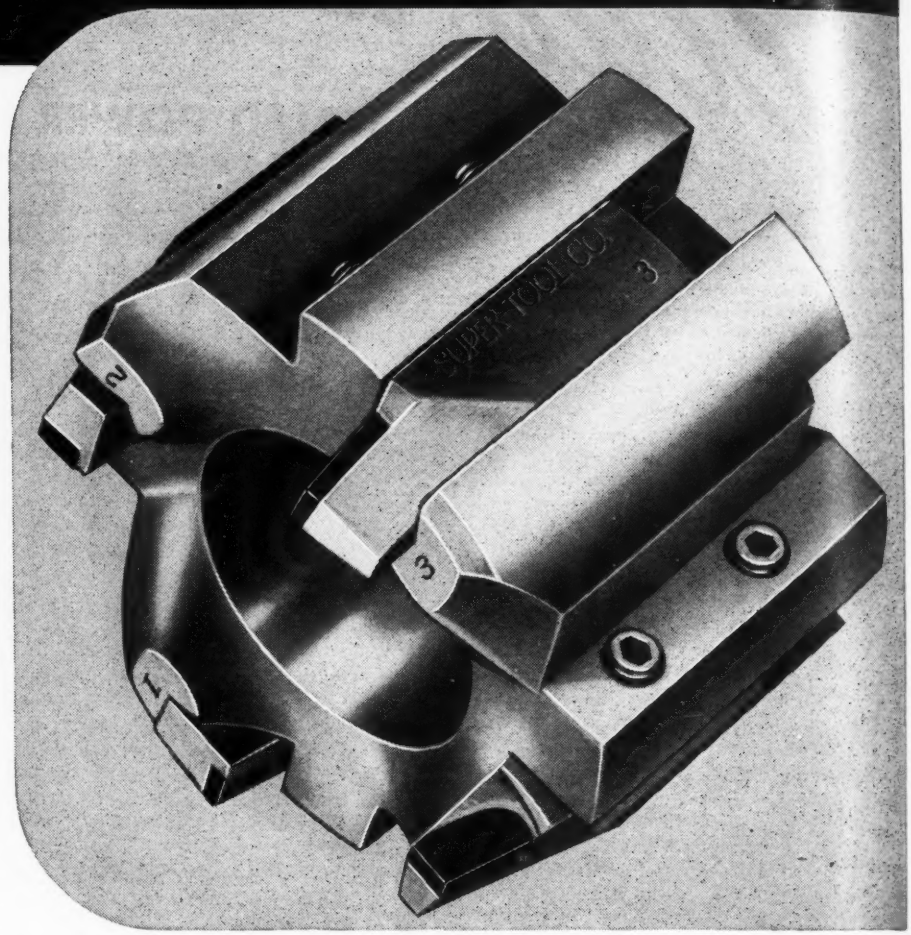
Get This Booklet

Write for it today on your business letterhead. *It's free!* You will find this booklet very useful as a timely and helpful reference on grinding wheels and abrasives. Besly Titan Steelbacs are easy to use . . . *They step up production.*

BESLY BESLY GRINDERS AND ACCESSORIES
BESLY TAPS • BESLY TITAN ABRASIVE WHEELS

CHAS. H. BESLY & COMPANY, 118-124 N. Clinton St.. Chicago 6, Illinois, Factory: Beloit, Wis.

"STEP UP" YOUR STEP CUTTING PRODUCTION WITH SUPER'S NEW ROTARY BROACH TYPE CUTTER



FAST, ECONOMICAL STEP CUTS

This new Super Tool can be positioned for step cuts up to ½" or more, giving high rates of metal removal, assuring maximum use of carbide in milling performance, long life and simplification of grinding methods.

Simple to set up . . . sturdy body . . . adequate chip clearance . . . this tool is built to "step up" the tough production job.

LOOK FIRST TO SUPER Whatever Your Cutting Job

In addition to all types of special carbide-tipped tools, Super Tool Company manufactures a complete line of standard carbide-tipped bits, reamers, plain and side mills, shell end mills, face mills, end mills, counterbores, drills and centers. Specify Super Tools . . . Get Super Satisfaction.

IT'S A VERSATILE TOOL . . . Can be used for FACE MILLING

Super's Rotary Broach Type Cutter while designed primarily for step cutting can be used on many jobs where face milling is required. This is accomplished by setting the bits even on the peripheral cutting edges and face.

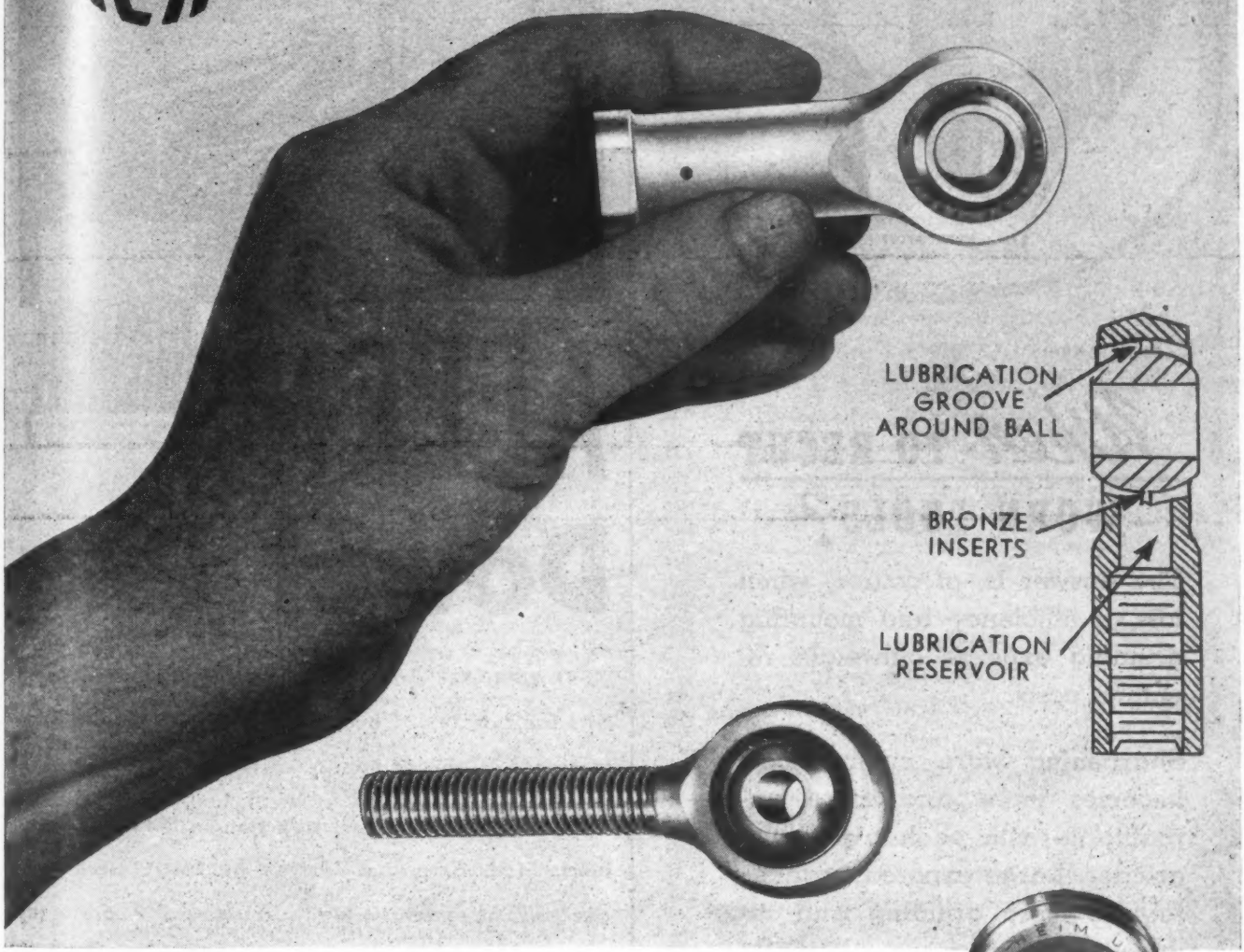
For the Finest Production Cutting Tools—Specify SUPER

SUPER TOOL COMPANY

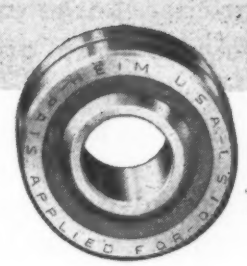
Carbide Tipped Tools

21650 Hoover Road, Detroit 13, Michigan ★ 4105 San Fernando Road, Glendale 4, California

HEIM UNIBAL SPHERICAL BEARING ROD ENDS



IT'S new to American industry, but it has proven itself in millions of installations in airplanes during the war. The principle and construction of the Heim Unibal bearing are unique. There is only one ball which rotates in a bronze bearing. Correction of misalignment is provided for in all directions, and both radial and axial loads too heavy for an ordinary bearing can be safely carried. Check your present methods of transferring motion at odd angles. You will find that the Heim Unibal bearing will do the job safer, cheaper, and better. There will be no false brinelling and strength will be added to your machines through the use of these self aligning bearings.



HEIM UNIBAL SPHERICAL BEARING

Please write for complete catalog.

THE HEIM COMPANY
FAIRFIELD CONNECTICUT

When TO RECUT WORN TOOLS?

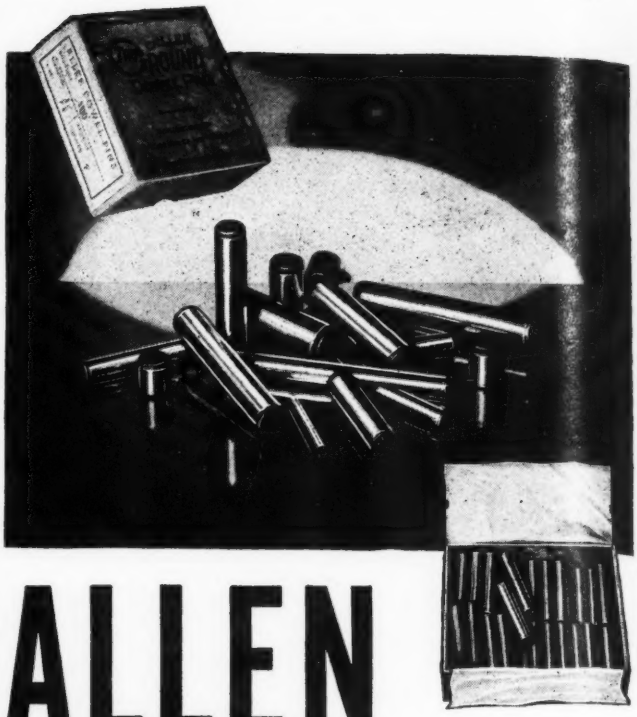
The answer is, of course, when loss of efficiency and mounting grinding expense outweighs re-cutting costs.

Sharpening worn cutting tools becomes more and more unprofitable with each trip to the grinder. Large exposed surfaces require more grinding and reduced chip clearance will finally make the tool unusable.

Take advantage of Rutland's re-cutting service before excessive wear has destroyed tool effectiveness—you will keep your cutters producing efficiently and—

YOU SAVE UP TO *70%*

Rutland TOOL SERVICE
13006 GREELY, DETROIT 3, MICH.
TOWNSEND 8-1661
INQUIRIES FROM AGENTS WELCOME



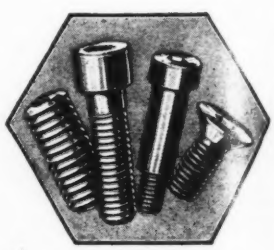
ALLEN Dowel Pins

"TRU-GROUND" for accurate locating of work: Ground to a limit of .0002" over basic size, with an allowable tolerance of plus or minus .0001".

"STEELED" to retain precision standards in die assemblies. Made of special-analysis ALLENOY steel, heat-treated to an extremely hard surface, with a core of the right hardness to resist any tendency to "mushroom" when driven into a tight hole.

Tensile strength: 240,000 to 250,000 lbs. per square inch. Here's the high safety factor in *holding-power* you always get for plus-measure in Allen products.

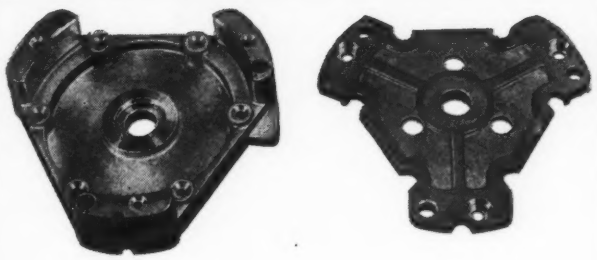
Ask your local ALLEN Distributor for samples and dimensional data . . . the same Distributor who serves you dependably with Allen Hex Socket Screws and other "life-lines" of essential supplies.



TRADE A MARK

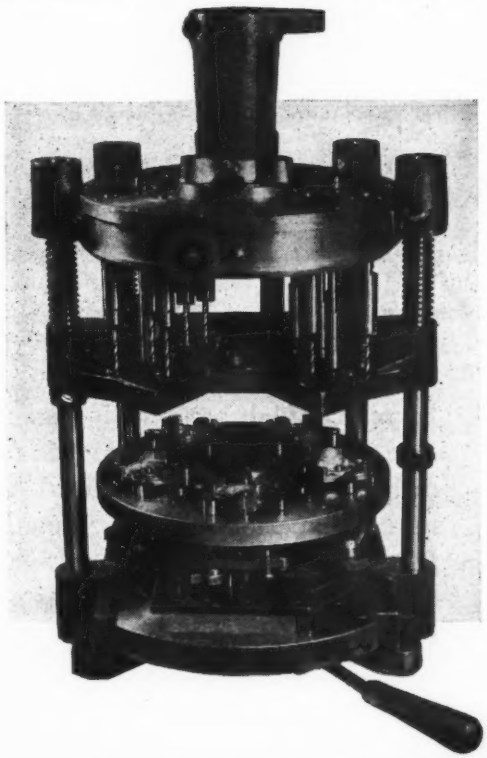
THE ALLEN MANUFACTURING COMPANY
HARTFORD 1, . . . CONNECTICUT, U. S. A.

A sure way to speed up small parts drilling and tapping



A sample of Ettco-Emrick results

60 high-precision operations were called for on this die-cast aluminum body and cover—18 drilling, 27 countersinking, 3 counterboring and 12 tapping. With four Multiple Heads engineered and supplied by us, all 60 operations are done in 90 seconds. Below is one of the Heads with its indexing fixture all ready to put on the drill press.



Whether a part has 2 holes or many, we can tool you up with Ettco-Emrick Multiple Spindle Heads to give you any drilling or tapping production you need.

The reason is that these Heads are more than just tools for drilling or tapping a number of holes at a time. Each head is engineered for a particular part to make possible the *fastest handling* of the part and the drilling or tapping of the *maximum* number of holes at every stroke of the press.

We can give you these results on a wide range of small parts, because the Ettco-Emrick System includes a dozen different work handling devices like the indexing fixture on the Head illustrated. They reduce the operator's work to loading parts and working the press. All locating, clamping and releasing is automatic.

Initial cost is low because Ettco-Emrick Multiple Heads are made of standard parts and handling fixtures are all standardized. And this is a temporary outlay, for it is paid back in quick time by savings in man-hours and machine hours.

FOR RECOMMENDATIONS on any particular small part, send us a sample or drawing with required production figures. We've engineered hundreds of such jobs and know the answers on small parts drilling and tapping.

For more examples of Ettco-Emrick results WRITE for the "Multiple Head reprints"

ETTCO TOOL CO.

592 Johnson Ave. Brooklyn 6, N. Y.

DETROIT 1 • CHICAGO 6

Over 25 years specialization in solving Industry's drilling and tapping problems

you, too, can take a short cut

THOMAS PRE-COATED

For many companies, Thomas coated cold rolled strip steel reduces operations. These special finishes eliminate part or all of the plating operations in your plant.

DURING PRODUCTION

Thomas coatings provide die lubrication and increase die life. These finishes are rust resisting. Best of all, they often permit increases in production.

IN YOUR PRODUCT

Thomas coatings provide a uniform coating on inside and outside of complicated parts which are difficult to plate. They are used as an ultimate finish and as a base for further plating.

Thomas Strip

COLD ROLLED STEEL STRIP

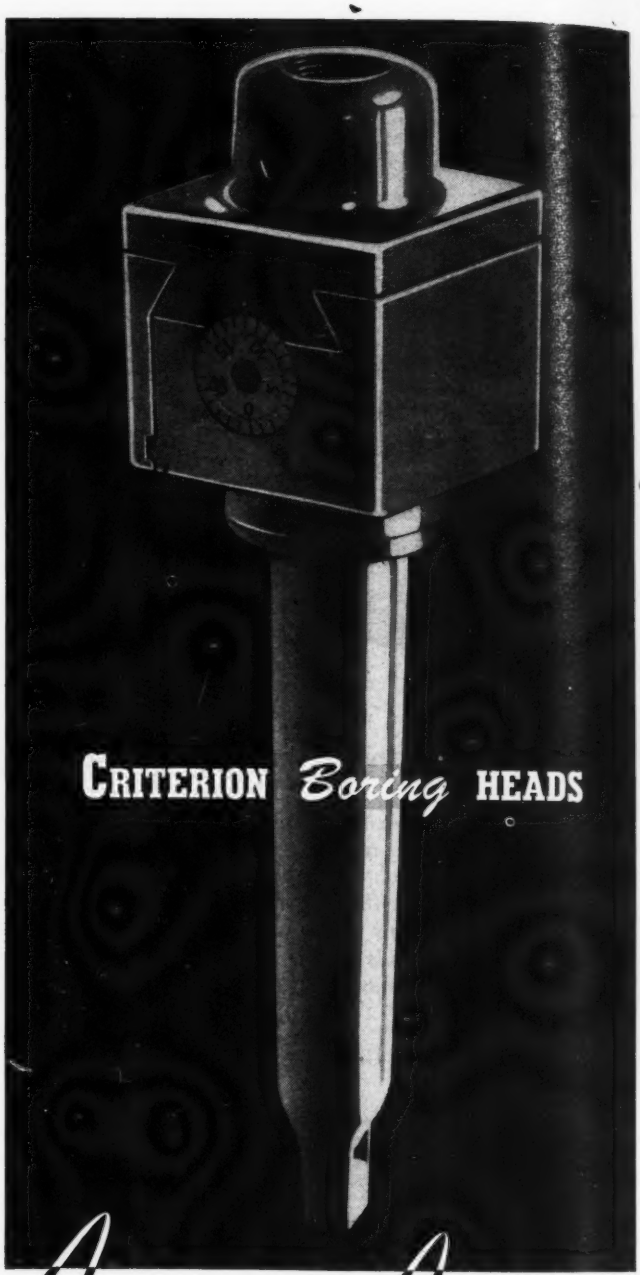
WRITE FOR LITERATURE

Kindly write your request on your company letterhead stating your title. This will help us to direct cold rolled strip steel data directly to you.

ELECTRO-COATED ZINC, COPPER, NICKEL AND BRASS . . . HOT DIPPED TIN AND SOLDER . . . LACQUER COATED IN COLORS . . . UNCOATED PRECISION STRIP, CARBON AND ALLOY SPECIALTIES

THE THOMAS STEEL CO. • WARREN, O.

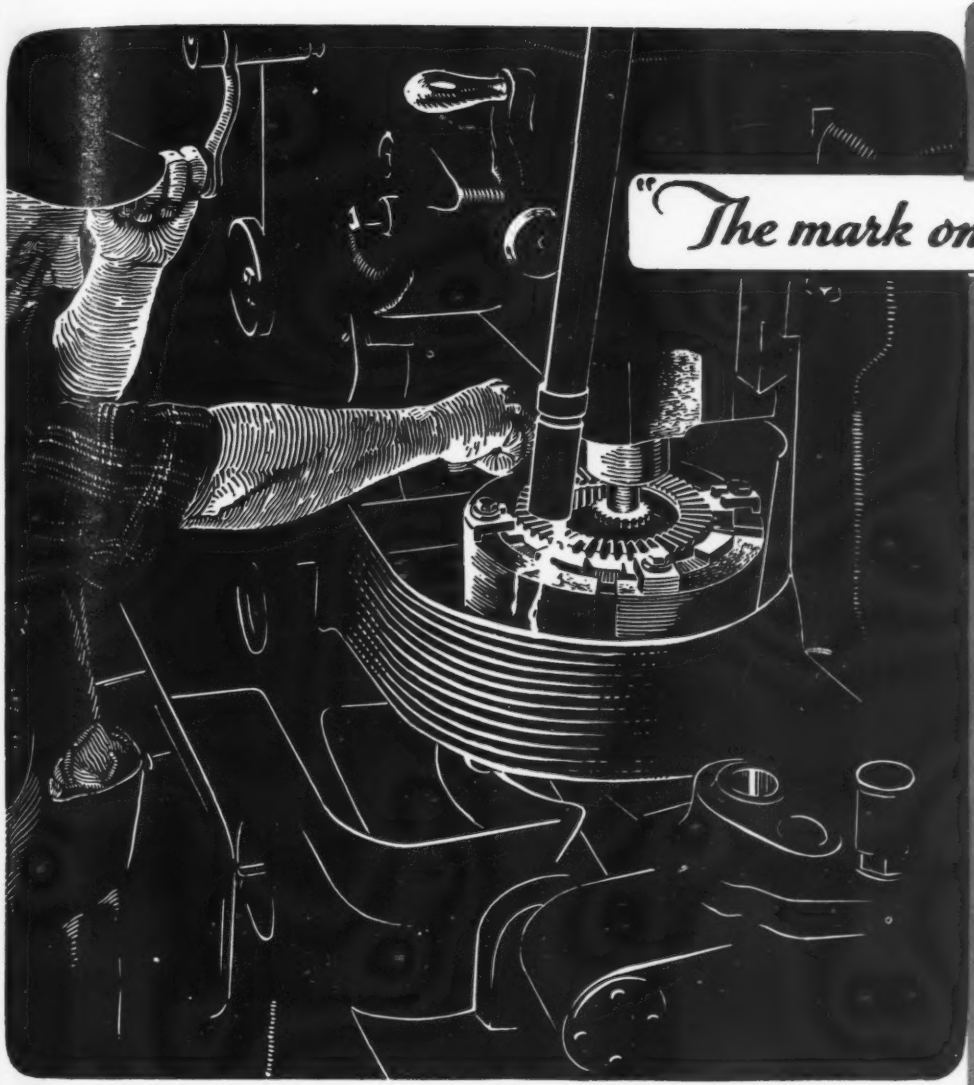
COLD ROLLED STRIP STEEL SPECIALISTS



Accuracy Accepted

Extremely high accuracy is a standard feature of Criterion Boring Heads. Moreover, original accuracy is maintained far beyond normal expectation. Lead Screw is ground from solid AFTER hardening. Shanks interchangeable. Criterion Heads are in use throughout the nation. Order from your dealer. Request free literature.

CRITERION MACHINE WORKS
BEVERLY HILLS, CALIFORNIA



"The mark on Finer Gears"

ILLINOIS GEARS

The shaping of an internal gear on a Fellows gear shaper.

We Are Never Too Busy To Be Helpful

War or peace, we *take* time to analyze problems that our customers bring to us pertaining to the transmission of power and the application of cut gears. Often we make helpful suggestions for re-arranging a gear train to conserve space or to use fewer gears. Whether it is a single gear for a mine shafthead or hundreds of gears for a builder of complicated machines, we are equally interested in the user receiving the gears that are most suitable for the job at hand.

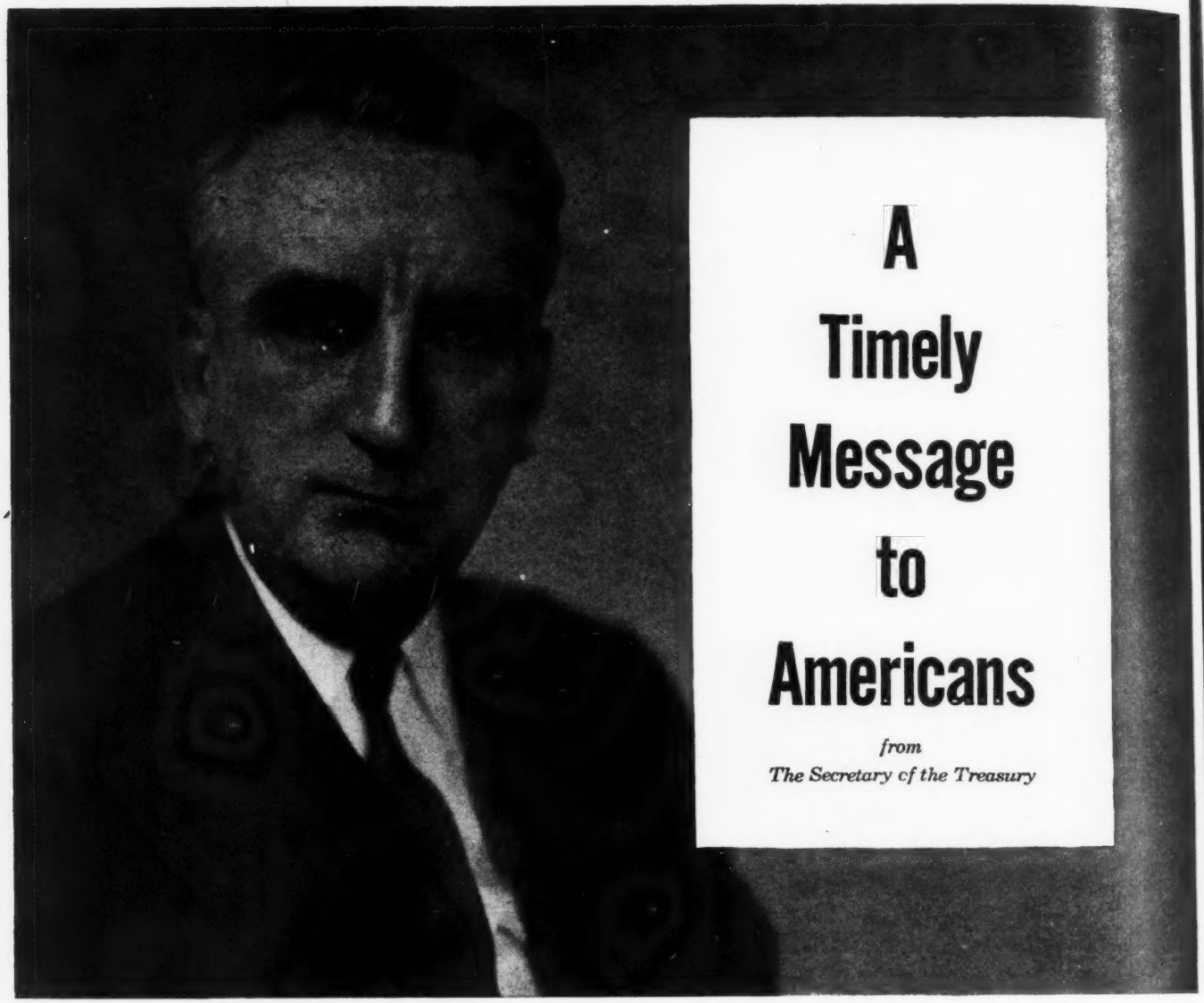
Too, we are vitally interested in the maximum performance of every gear we make. That is why they must come up to the "Five Star" standard we've set for ourselves: ★ Material is double-checked, ★ All cutting done by skilled craftsmen, ★ Required accuracy has been in-built, ★ Every gear is double-inspected after completion, ★ Delivery is as promised.

Wherever you are, you can acquaint yourself better with our *service-ful* organization by sending for a copy of Catalog 39 — our service is nationwide.

ILLINOIS GEAR & MACHINE CO.
Chicago (35), Ill.

ARMY ★★ E ★★ NAVY

ILLINOIS GEAR & MACHINE COMPANY



A Timely Message to Americans

from
The Secretary of the Treasury

America has much to be thankful for.

Abroad we have overcome enemies whose strength not long ago sent a shudder of fear throughout the world.

At home we have checked an enemy that would have impaired our economy and our American way of life. That enemy was inflation—runaway prices.

The credit for this achievement, like the credit for military victory, belongs to the people.

You—the individual American citizen—have kept our economy strong in the face of the greatest inflationary threat this nation ever faced.

You did it by simple, everyday acts of good citizenship.

You put, on the average, nearly one-fourth of your income into War Bonds and other savings. The 85,000,000 owners of War Bonds not only helped pay the costs of war, but also contributed greatly to a stable, prosperous postwar nation.

You, the individual American citizen, also helped by cooperation with rationing, price and wage controls, by exercising restraint in your buying and by accepting high wartime taxes.

All those things relieved the pressure on prices.

THE TASK AHEAD

We now set our faces toward this future: a prosperous, stable postwar America—an America with jobs and an opportunity for all.

To achieve this we must steer a firm course between an inflationary price rise such as followed World War I and a deflation that might mean prolonged unemployment. Prices rose more sharply after the last war than they did during the conflict and paved the way for the depression that followed—a depression which meant unemployment, business failures and farm foreclosures for many.

Today *you* can help steer our course toward a prosperous America:

—by buying all the Victory Bonds you can afford *and by holding on to the War Bonds you now have*

—by cooperating with such price, rationing and other controls as may be necessary for a while longer

—by continuing to exercise patience and good sense with high faith in our future.

The challenge to America of switching from war to peace with a minimum of clashing gears is a big one.

But it is a small one compared to the tasks this nation has accomplished since Sunday, December 7, 1941.

Fred M. Vinson
Secretary of the Treasury

A Government message prepared by the War Advertising Council and contributed by this magazine in cooperation with the Magazine Publishers of America

Here's Help FOR YOUR TOOL ROOM

The New COVEL
CUTTER & TOOL GRINDING MANUAL

A time-and-money saving factual aid for new hands in the toolroom—and for seasoned veterans, too! A 128-page book that takes you through every step in setting up all types of milling cutters for grinding; that explains in graphic detail the use of various accessories on cutter and tool grinders;—covers thoroughly the operation and use of a cutter and tool grinder;—gives practical help in choosing the right grinding wheel for every job . . . Plus page after page of grinding tips and short cuts that will mean added savings in time and manpower for you. And there's a whole section of tables and charts, arranged for handy reference, to cut down pencil and guess work. Write your name and position on your company letterhead, and send it to us for a free copy of this new Covel Manual, "Universal Cutter and Tool Grinding"—A regular $1.00 value—but it's *free* to you toolroom and production men. Write for "Handbook 1 75" **today.**

This is just another example of Covel Service to industry. Since 1874, manufacturers have been bringing their grinding problems to Covel, with complete satisfaction. This company now offers a complete line of Cutter and Tool Grinders, Drill Grinders and small Surface Grinders. Let Covel experience show you what can be done to improve production and cut costs in your toolroom.

Covel No. 12 Cutter and Tool Grinder

See your nearest Covel Dealer or Write for Bulletin M-115.

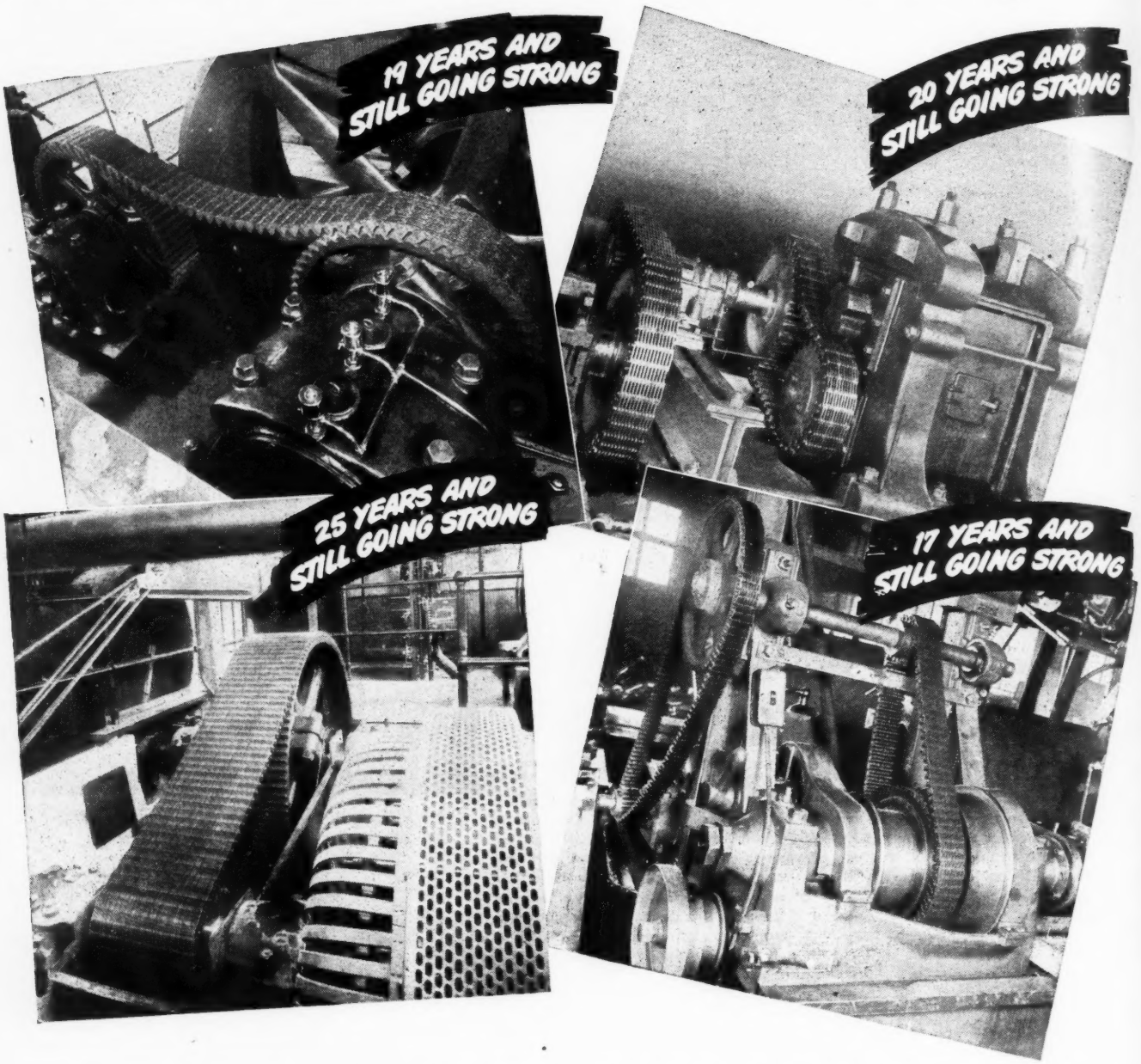
GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

How Long

WILL A MORSE DRIVE LAST?


19 YEARS AND STILL GOING STRONG
20 YEARS AND STILL GOING STRONG
25 YEARS AND STILL GOING STRONG
17 YEARS AND STILL GOING STRONG

Durability in power transmission equipment is not enough . . . it has to be so efficiently designed that it "stays modern" so that plant production continues to meet modern competition. Many Morse drives in use fifteen years and longer today are just as modern in their operation and *cost of operation* as the day they were installed. Postwar's keener competition demands this type of foresighted equipment selection. Call your Morse engineer for information on how Morse drives are helping other manufacturers get top efficiency—how they can help you.

SPROCKETS CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE *Roller and Silent* CHAINS

MORSE CHAIN COMPANY • ITHACA, N.Y. • DETROIT 8, MICH. • A BORG-WARNER INDUSTRY

MORE PRODUCTION PER MAN HOUR

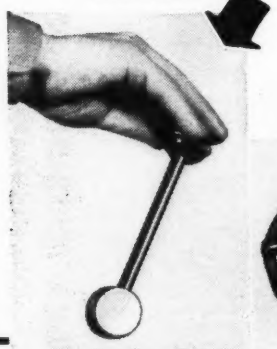
These smaller size Niagara Inclinable Presses offer the same design features of larger Niagara Models. The instant acting 14-point sleeve clutch is an important factor in increasing the output per man hour. It is possible that one or more of these presses can help you in speeding up production of urgently needed material.

NIAGARA MACHINE & TOOL WORKS
BUFFALO, N. Y.
DETROIT • CLEVELAND • NEW YORK

• BUY UNITED STATES VICTORY BONDS •

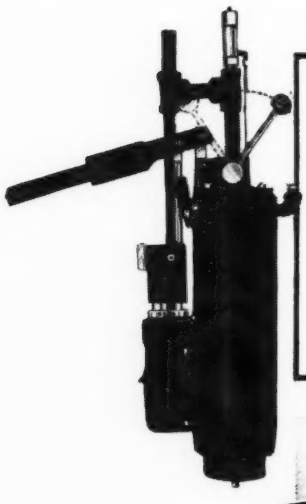
HERE'S WHY KRW PRESSES

THIS...



NOT THIS

★ FINGER TIP VALVE CONTROL is opened or closed with the flip of a finger. No slow and awkward screw-type valve to fumble with. One of many KRW features that mean faster work.

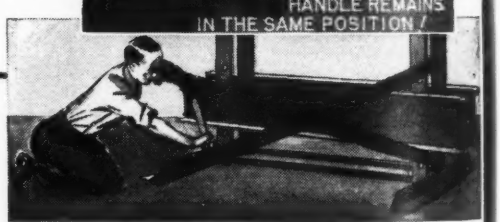


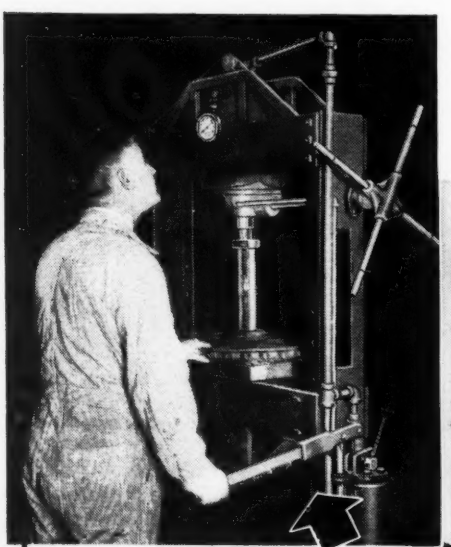
★ TWO SPEED PUMP. A half turn of the winged finger lever selects the speed desired. Second speed is 2-1/2 times faster than normal action. Only on KRW Presses is this manually selected ram speed available.

THIS...

★ ONE MAN BED-SHIFTING DEVICE. The easy-to-operate KRW location plus the ratchet controlled drum make bed adjusting a simple operation. Crank stays at convenient position regardless of bed height ... no reaching or stooping necessary.

NOT THIS





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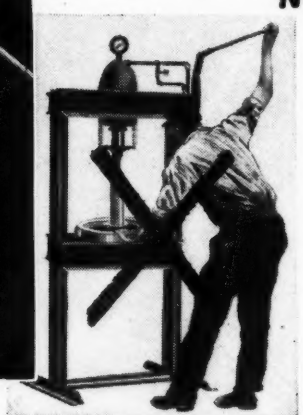

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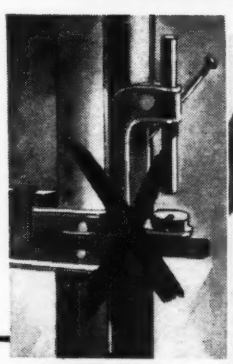
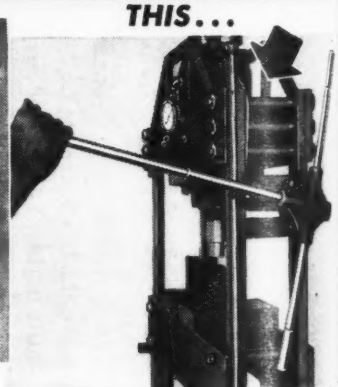




NOT THIS

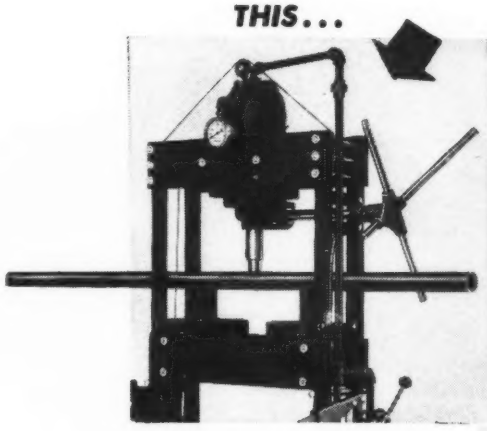
★ CONVENIENT PUMP HANDLE LOCATION. The only correct pump handle location is slightly below a man's waist level. There's no straining to pump awkwardly, creating worker fatigue. Operator is free to watch the near-eye-level pressure gauge.

★ "BUILT-IN" MECHANICAL ARBOR PRESS. Provides the advantages of the large adjustable press bed ... makes possible the use of V-Blocks where necessary. Hand wheel operates the ram mechanically with 3 to 4-ton pressure. You can switch to hydraulic pressure by flipping the valve control.

ARE BETTER

STUDY THESE KRW FEATURES IN TERMS OF YOUR MANUFACTURING OPERATIONS . . . *Your profits!*

THIS...



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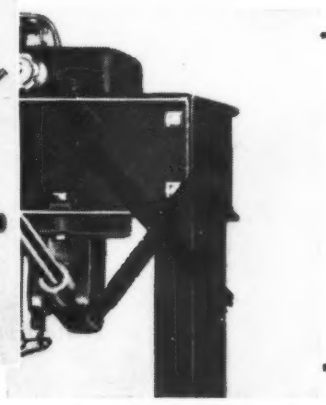


★ OPEN ENDS FOR LONG WORK. Permits any length work to be supported on V-Blocks directly under the ram. On other presses work must be passed through diagonally. KRW Presses handle long shafts and bars without loss of speed or accuracy.

★ Here, on these pages, you can see the proof of KRW superiority... no other hydraulic arbor press can boast of these money-saving features. Before you buy any other make of hydraulic arbor press, check their value to you in terms of your own daily operations . . . manufacturing costs . . . employee morale . . . and Profits. Many operations that can be done easily on a KRW Press cannot be handled at all on other makes of presses. Using simple, inexpensive dies, it is possible to perform many bending, straightening, flattening, offsetting, assembling and other operations at lower cost per unit. Investigate . . . our special Hydraulic Press Catalog will give you all the facts you want. Write for it today.

SEND FOR THIS 24-PAGE ILLUSTRATED HYDRAULIC PRESS CATALOG ...full of valuable data!

SINCE 1916 KRW A MARK OF DEPENDABILITY

K. R. WILSON

BUFFALO 3, NEW YORK

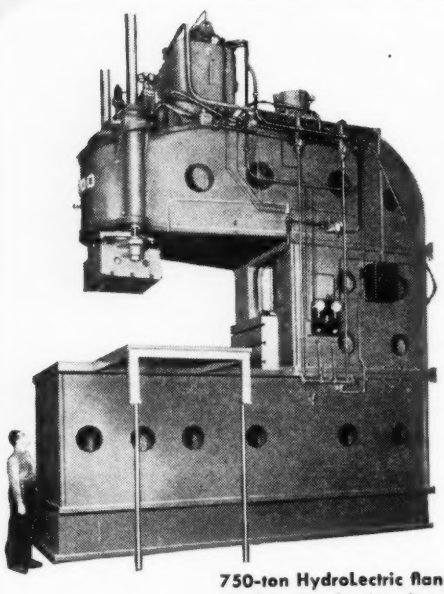
NOT JUST **PRESSES**

but

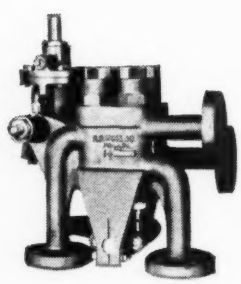
MEANS OF CUTTING COSTS

Manufacturers must use the most efficient production equipment available to remain in business and maintain full employment. Experience has proven that hydraulic presses are at the top of the list of important production tools.

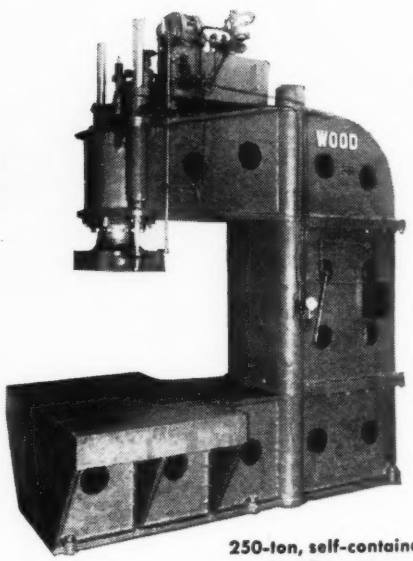
The presses here illustrated merely suggest the wide variety of sizes and types that Wood builds. Included in Wood experience are forging, forming, bending, drawing, crimping, forcing, joggling, straightening, stamping, flanging and every other type of hydraulic press for the metal working industries. Why not consult Wood engineers? Write outlining your requirements.



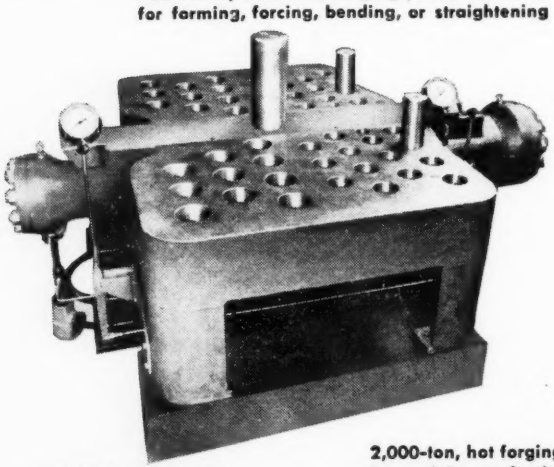
750-ton HydroLectric flanging press, used also for forming, forcing, bending, or straightening



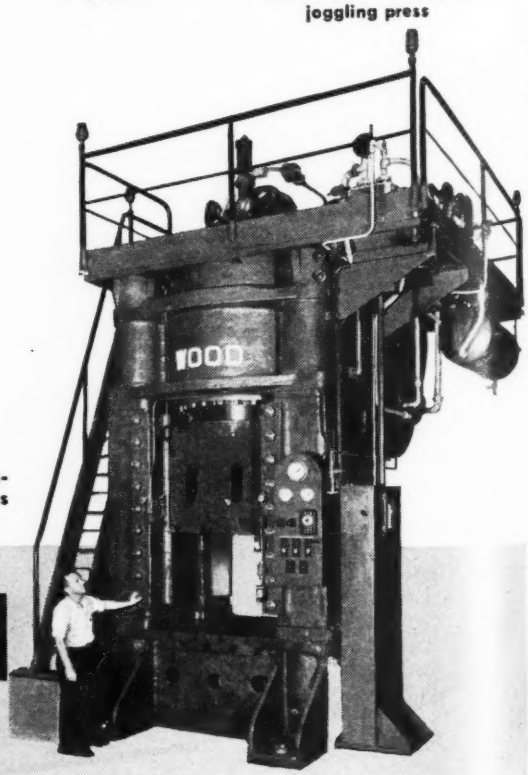
4-way operating valve, air cylinder operated



250-ton, self-contained, joggling press



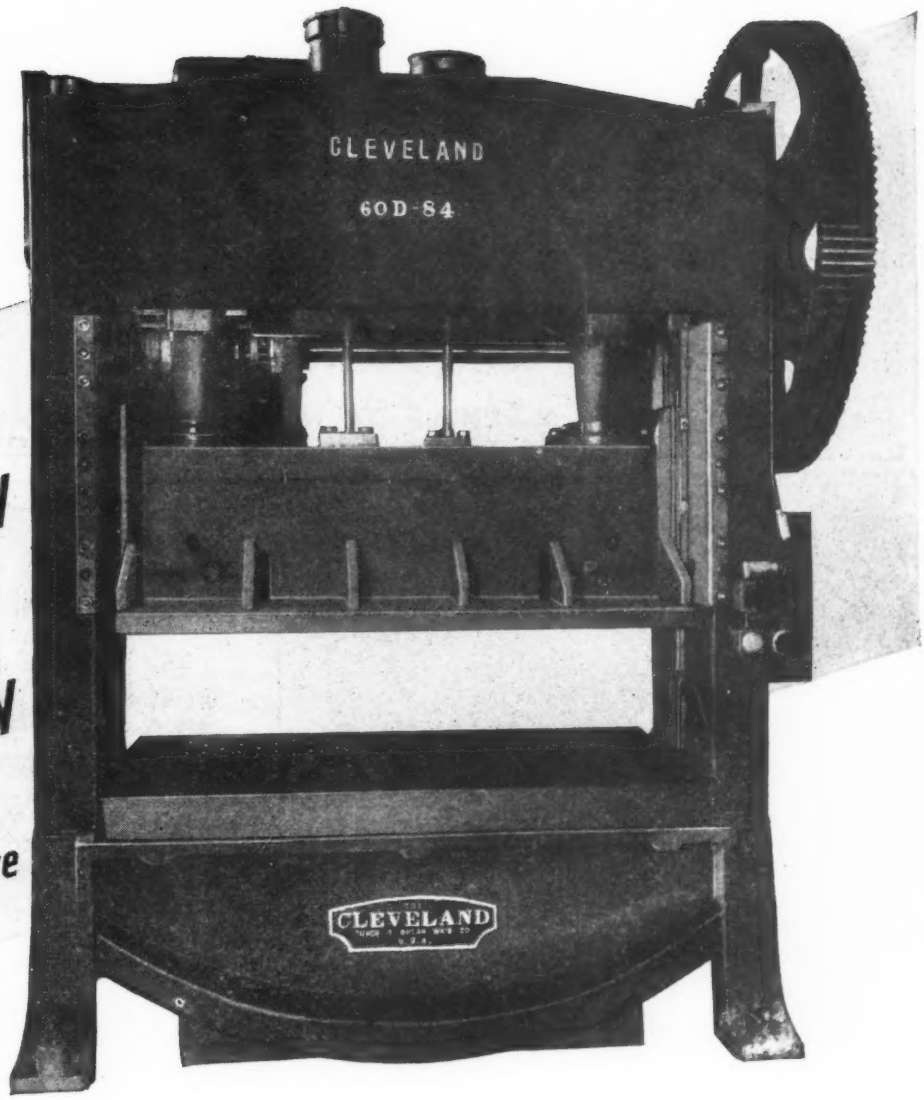
125-62½ ton, double-ended bending press



2,000-ton, hot forging, forming, coining or forcing press

EST. 1803 R. D. WOOD CO. PUBLIC LEDGER BUILDING INDEPENDENCE SQUARE PHILADELPHIA 5, PA.

ACCURATE PRODUCTION · EFFORTLESS OPERATION at 33 strokes per minute



When your plans call for Presses – dependable Mechanical Power Presses – consult Cleveland, because our sixty-four years experience in the field of Metal Working Tools has given us some pretty definite, practical ideas of what is required in the line of Presses for the accurate and economical production of pressed metal parts.

Whether your requirements call for small Open Back Inclinables or the very largest Four Point Presses, you will find that Cleveland machines embody every desired feature for long life and dependability, and that each type can be furnished in sizes and capacities to meet every need.

Cleveland Straight Sided Double Crank Press, single geared, single end drive, equipped with electrically controlled air friction clutch.

Stroke . . . . . 14"
Adjustment . . . 4"
Bed area . . 46"x84"
Strokes per minute 33
Capacity . . 130 tons

THE CLEVELAND PUNCH & SHEAR WK'S CO. U. S. A.

Modern Presses THE CLEVELAND PUNCH & SHEAR WORKS COMPANY *Cleveland, Ohio*
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"Tight rivets that will not work loose"

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"Loose rivets that will not bind"

Grant Noiseless Rivet Spinner

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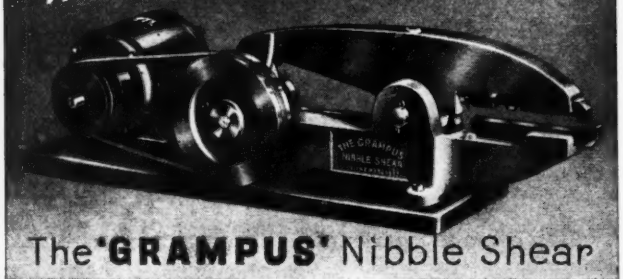
THE MACHINE THAT SOLVED MANY OF BRITAIN'S SHEET METAL PROBLEMS IN THE EUROPEAN WAR!



The "**GRAMPUS**" Nibble Shear

U.S.A. Patent No. 2333293. Patented also in Canada. Other Patents pending.

Trims difficult Pressings, Channel Sections, Panels, Tubes, etc., in all metals, and in many materials, including: Hide, Fibre and Paper. Seams, Tucks, Beads, Grooves with Form Tools in place of Cutters.

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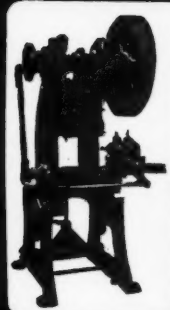

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DIAL FEEDS
ROLL FEEDS

For any size and type of press. Reels for feeding coil stock. Dial feeds for 8, 12 or 16 stations—1 to 3 operations. Single and double type roll feeds. Write for prices and specifications.

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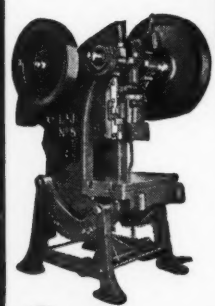

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5 TO 79 TONS

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49 Ton Capacity
45 Strokes per minute
*10¼ Die Space
(Bed to slide, stroke down, adj. up)
4" Standard Stroke
6700 lbs. weight
Also available in plain flywheel type
*No. 5 Special has 15¼" Die Space

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The V & O Press Company, Incorporated

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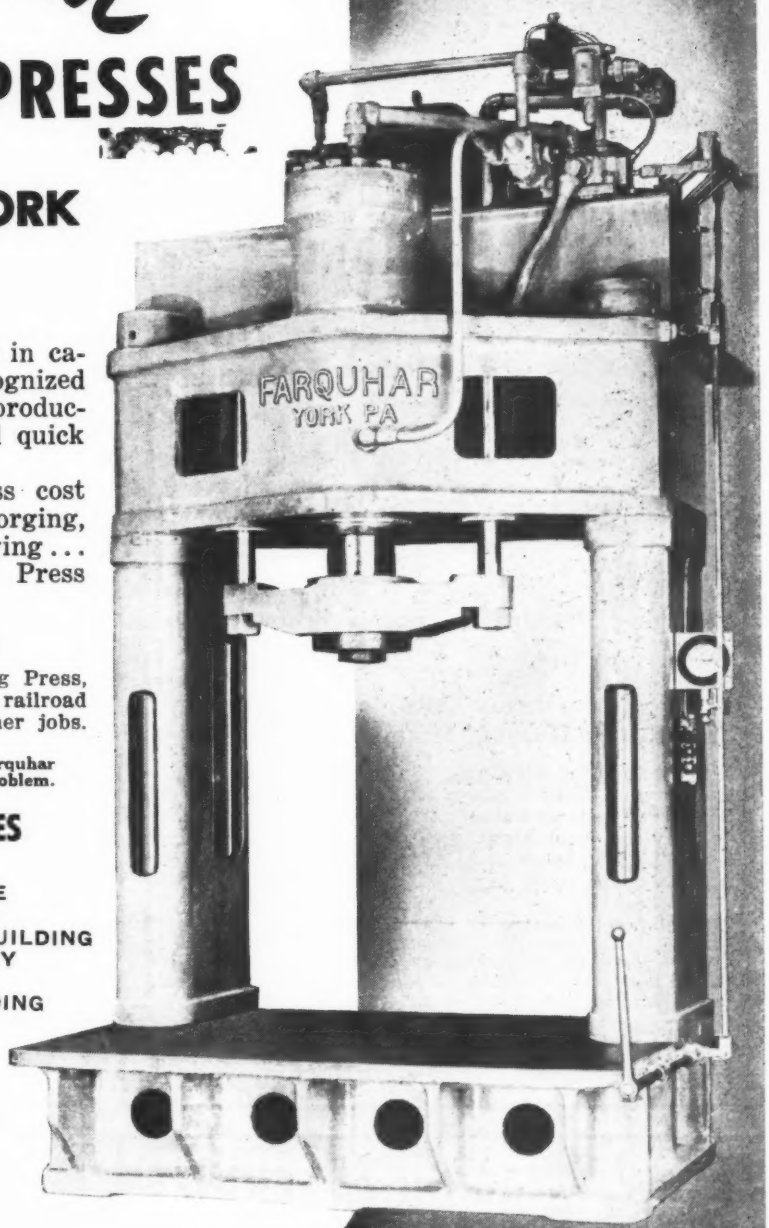
Farquhar Hydraulic Presses, built in capacities from 3 to 7200 tons, are recognized by men responsible for sustained production for their speed, accuracy and quick response.

For faster, better work at less cost when producing with pressure . . . forging, straightening, forming or drawing . . . consult a Farquhar Hydraulic Press Engineer.



100-TON BUSHING PRESS

The 100-Ton Farquhar Hydraulic Bushing Press, shown at right, is particularly suitable for railroad and car shop work as well as many other jobs.

Designed for your specific application, a Farquhar Hydraulic Press may solve your production problem.

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Hydraulic Press Division

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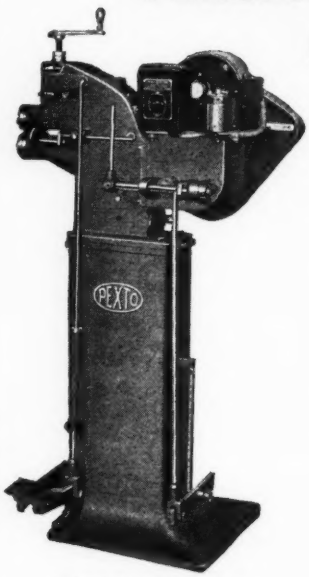

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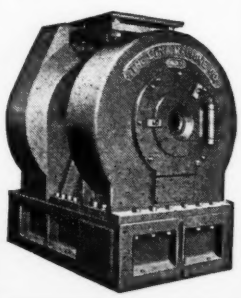

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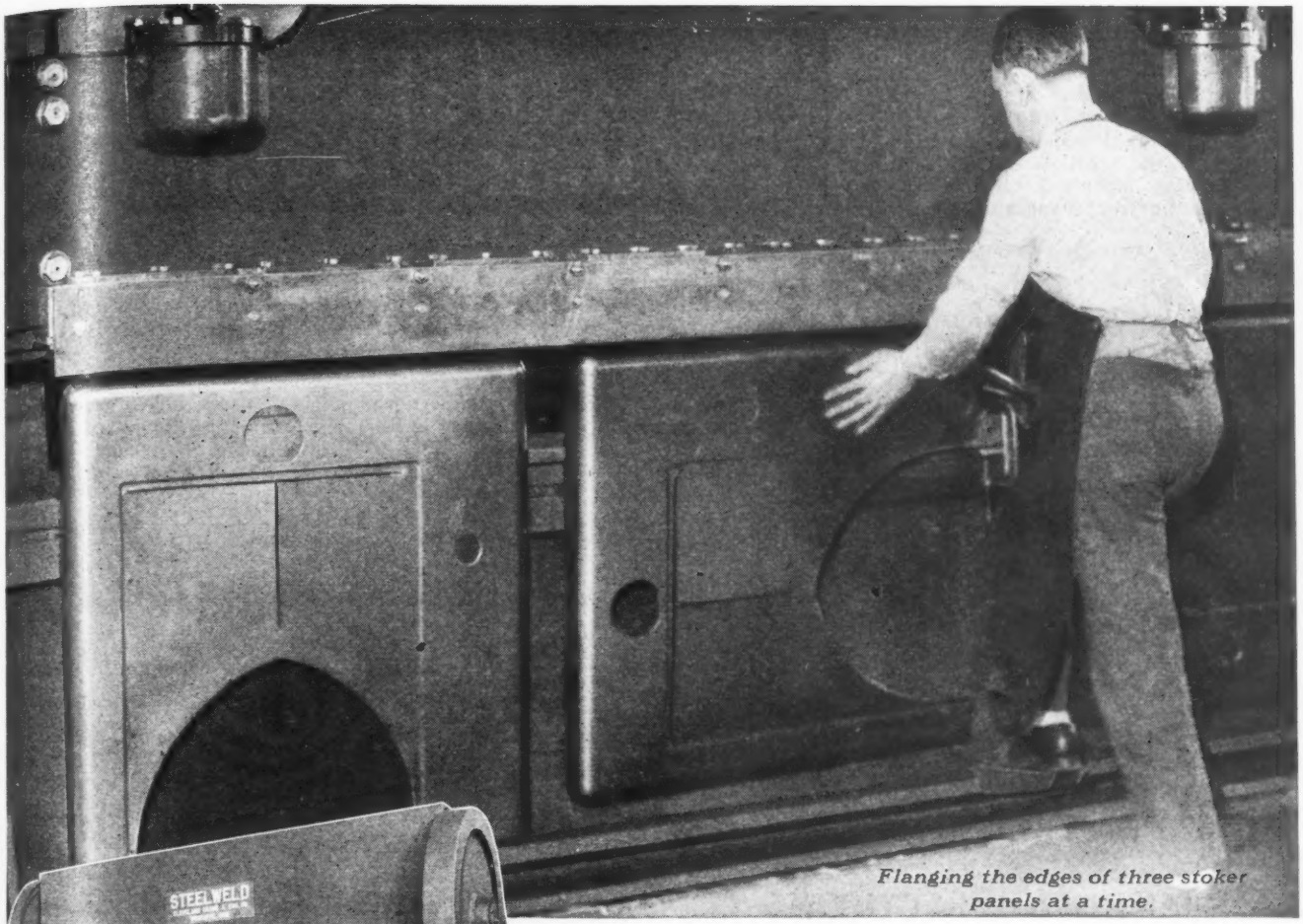

Flanging the edges of three stoker panels at a time.

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Just another simple job on STEELWELDS

Did you ever have a problem in metal forming? Did you ever wonder how to make some unusual shape — and do it at the least possible cost? Many Steelweld customers have been confronted with such situations. Very often they have discovered the solution to be in their Steelweld press right in their own shop.

A stoker manufacturer had a problem on how to flange the edges of stoker panels. They had to be round and neat on three sides. He found the answer in his Steelweld. Now he flanges the edges of three panels per ram stroke quickly and accurately.

The varied work and the simplicity with which it can be done, makes a Steelweld press an unusually versatile tool that is appreciated more and more as its possibilities are discovered with actual experience. Write for booklet below and get the details.

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CATALOG No. 2002 gives complete construction and engineering details. Profusely illustrated.

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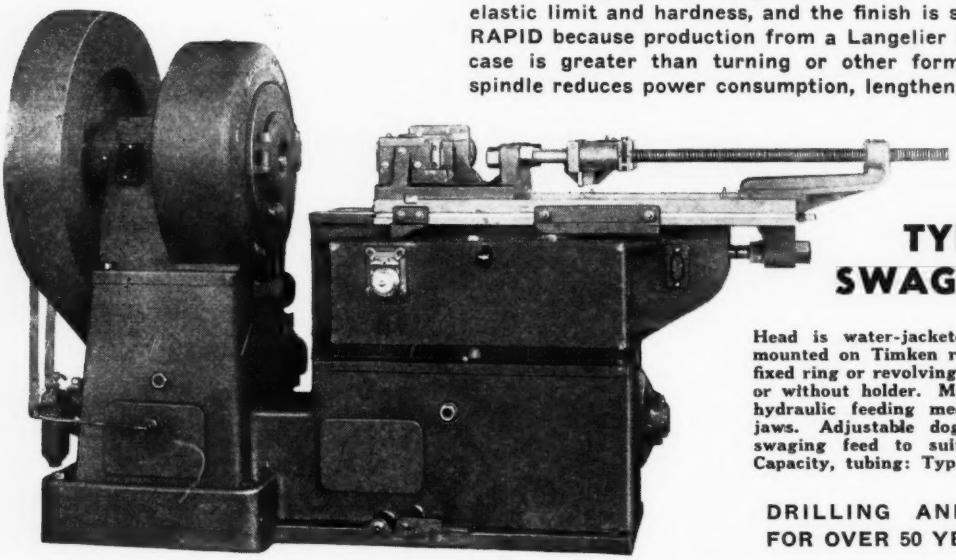
Rotary Swaging on new-design Langelier Swaging Machines is ECONOMICAL because no material is removed during swaging operation . . . . PRACTICAL because swaging improves grain structure of metal, increases its tensile strength, elastic limit and hardness, and the finish is smooth, to size, and straight . . . . RAPID because production from a Langelier Swaging Machine in almost every case is greater than turning or other forming operations. Timken-mounted spindle reduces power consumption, lengthens life of parts, and provides close concentricity between revolving spindle and circle of head rolls. Investigate!



TYPE D and E SWAGING MACHINE

Head is water-jacketed for hot or cold swaging. Spindle mounted on Timken roller bearings. Head construction with fixed ring or revolving cage is optional. Can be furnished with or without holder. Machine as shown here is equipped with hydraulic feeding mechanism and hydraulic work clamping jaws. Adjustable dogs vary length of quick advance and swaging feed to suit requirements. Return is automatic. Capacity, tubing: Type D, 1⅛". Type E, 1½".

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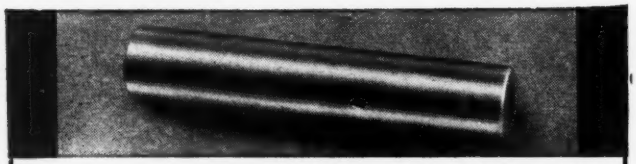

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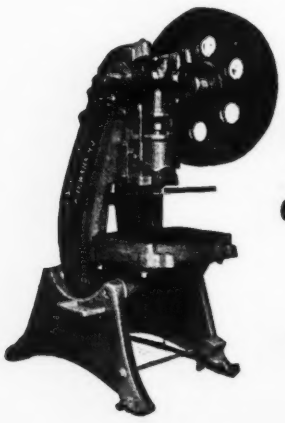

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of all types and sizes

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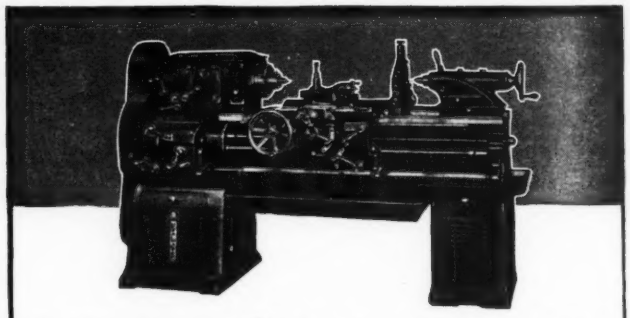

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- Quick Change Gear Device
- Double Wall Apron
- Tailstock
- Compound Rest
- Tool Post with Ring, Wedge, Square
- Steady Rest
- Face Plate
- Dog Plate
- Head Center Bushing
- Chasing Dial
- 2-Centers
- Wrenches
- Motor Mounting and Wiring
- Push Button and Starter
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- Automatic Lubrication in Head
- Cabinet Legs on Head and Tailstock End of Bed
- Lever Control for Length and Cross Feeds
- Mechanical Apron Clutch Control
- Threaded Spindle Nose

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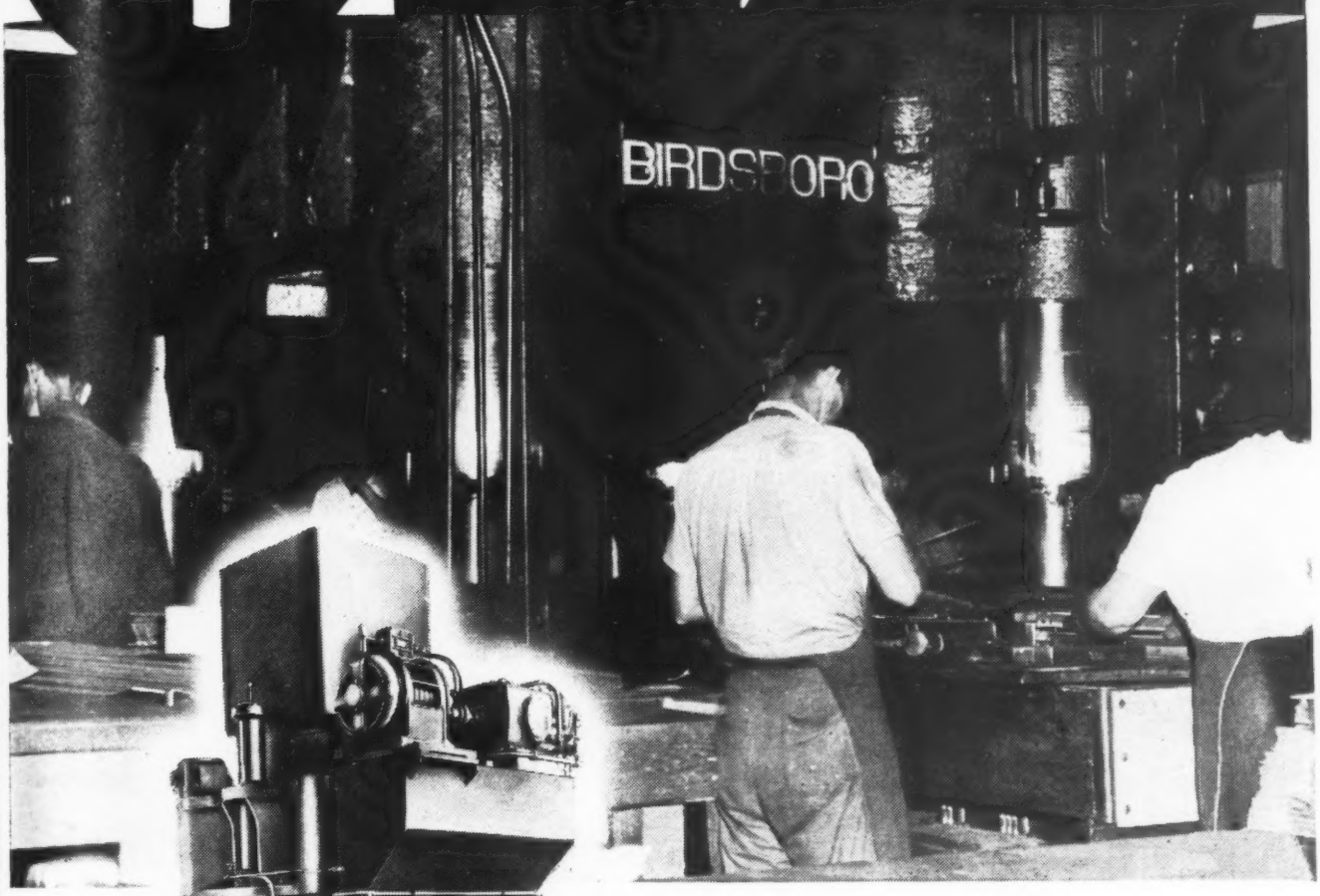
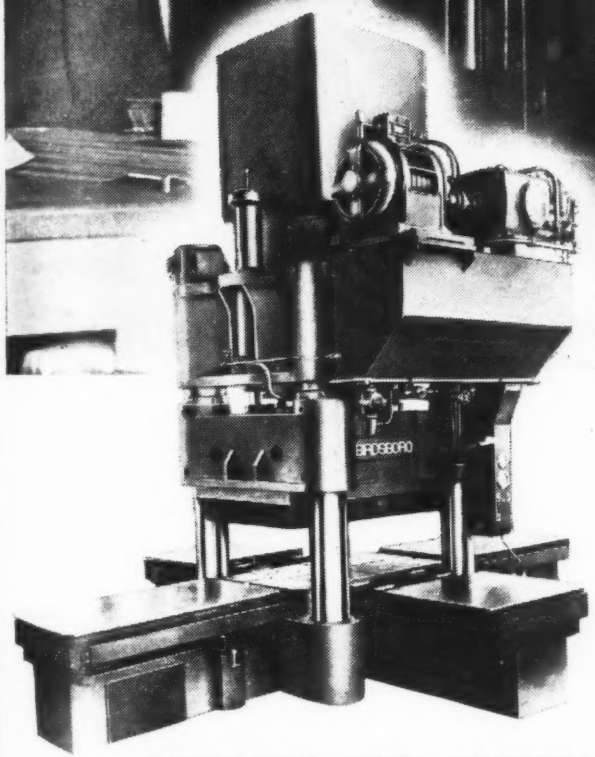
1840—1945 CINCINNATI, OHIO

4 AUTOMATIC TABLES Provide *Uninterrupted Production*





All the productive capacity of this patented Birdsboro four-station shuttle-table press has contributed to bringing V-J Day sooner by speeding the output of plane parts. Now that peace-time production is again called for, this fast, sturdy, automatically operated hydraulic press will do its share to make *more* products — *better* —and at a *lower cost.*

Investigate the possibilities of Birdsboro Hydraulic Presses today. Our engineers will be glad to consult with you on your own particular products and production requirements.

BIRDSBORO STEEL FOUNDRY AND MACHINE CO., Reading, Pa.

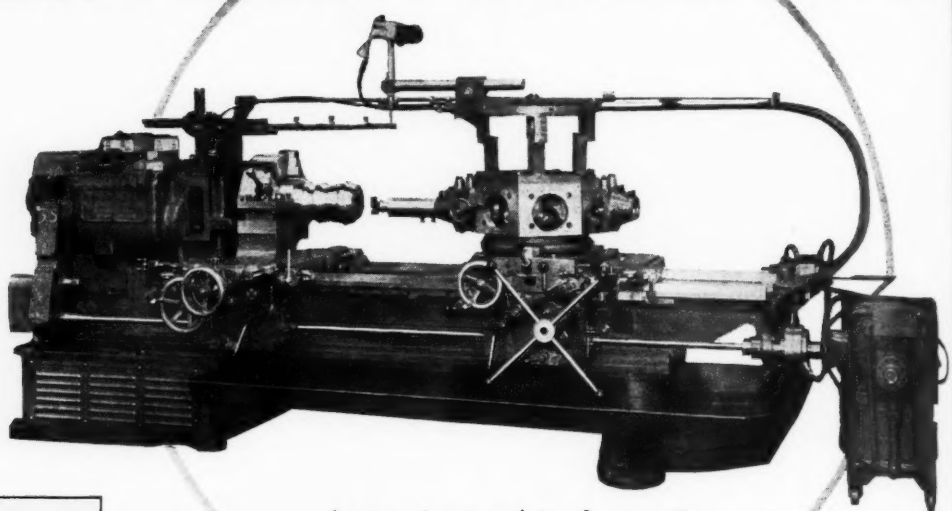
Representatives in: Cincinnati, Ohio; Indianapolis, Indiana; Kansas City, Missouri; Los Angeles, California; Oklahoma City, Oklahoma; Pittsburgh, Pennsylvania; and Tulsa, Oklahoma.

BIRDSBORO

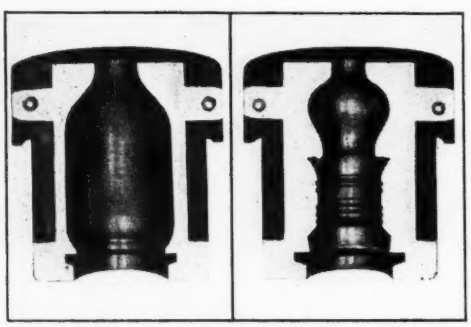
HYDRAULIC PRESSES

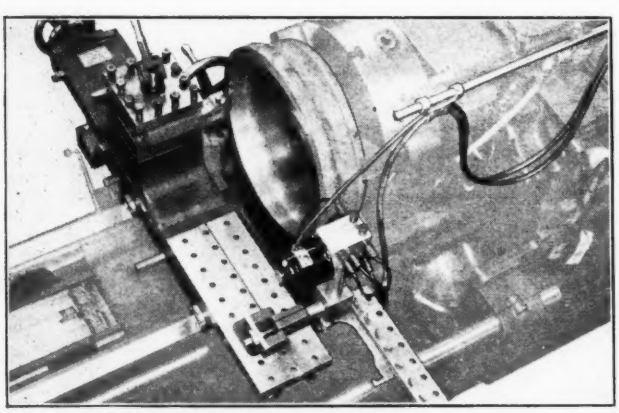
Something New!

LOW COST DUPLICATING WITH THE ACME-DUPLIMATIC



Inexpensive templates for practically any class of work is all that is required for the different jobs.





A new development in low cost contour turning and boring for Plastic, Glass and Rubber Molds; all types of Dies. No shapes too difficult.

Through the means of a push button station, the duplicating equipment can be disengaged, and the machine is then ready for standard turret lathe work.

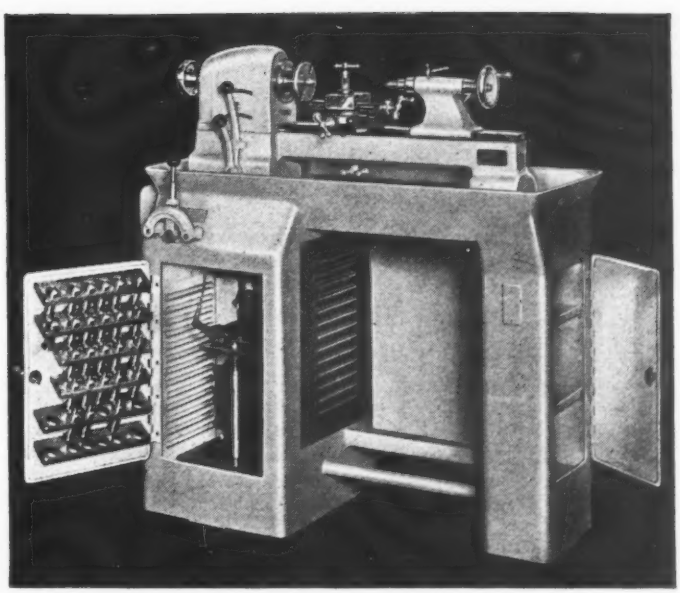
If you are interested in lowering the cost on your present methods for this type production — we can help you. It's a subject for our engineers — so — send us your problems. No obligation — of course.

The ACME MACHINE TOOL Co.
CINCINNATI 32, OHIO

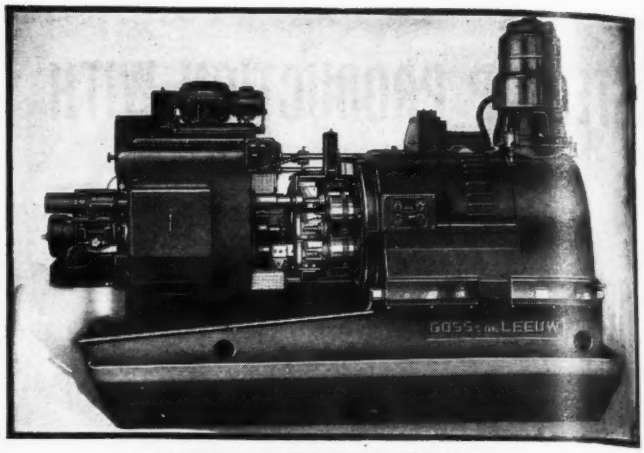
STEP UP PRODUCTION WITH ELGIN BENCH LATHES

PUT your small-diameter work on these improved Elgin Precision Bench Lathes—and watch production climb! They're designed for fast operation, sustained accuracy, minimum operator fatigue. DESK-TYPE BENCH LATHE (above) has Variable Speed Drive permitting instant changes of spindle speeds over a range of 40 to 4000 RPM without stopping spindle or changing belt. Motor mounted in base, fully enclosed, cross ventilated, easily accessible. Compact electrical equipment quickly hooked up for immediate operation. Four ample drawers (all with locks) for collets, face plate, chucks, etc. 1" collet capacity, 9" swing, 17" between centers. KNEE-HOLE TYPE BENCH LATHE (right) has variable speed range of 120 to 3800 RPM, 9" swing, 17" between centers, 1" collet capacity. Door of motor cabinet fitted with handy collet rack. Three roomy shelves for storage. Write for specifications, prices and delivery dates on these and the rest of Elgin's complete line of Precision Bench Tools.

ELGIN TOOL WORKS
1770 Berteau Ave., Chicago 13, Ill.

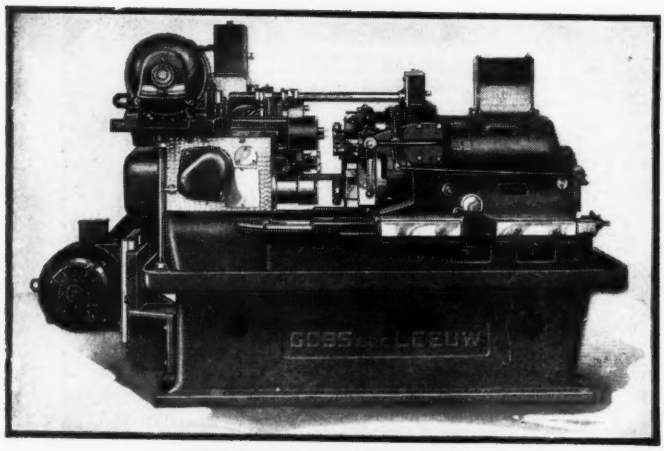


GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES



WORK ROTATING TYPE

5 Spindles • 6 Spindles • 8 Spindles



TOOL ROTATING TYPE

4 Spindles • 5 Chucking Positions

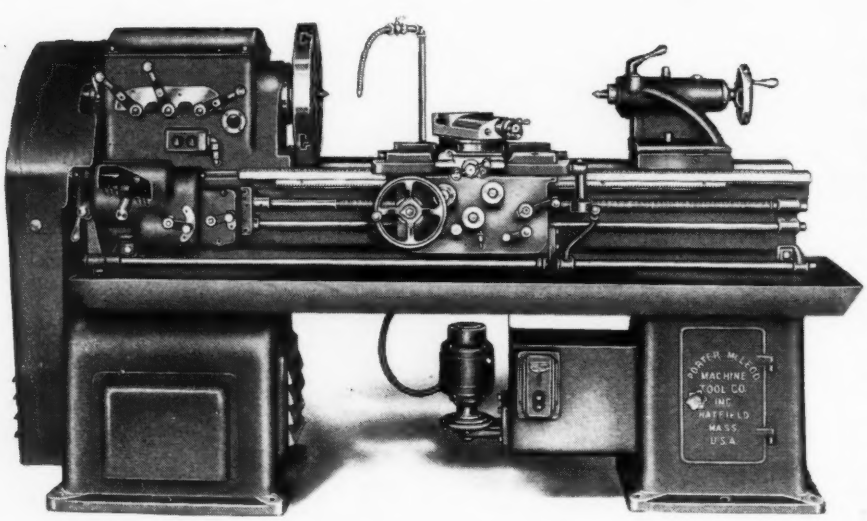
Both types of machines provide lead screw threading. Oversize spindles on these machines are mounted on pre-loaded anti-friction bearings. Ways are hardened; gears are of chrome-nickel steel, carefully heat-treated.

The many modern features offered in these machines are fully described in catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

NO FRILLS! NO GADGETS! BUT A RUGGED, DEPENDABLE LATHE

A Tool designed for THRIFT-MINDED production men without sacrificing an iota of accuracy — holds production work to size within "tenths"



PORTER-McLEOD GEARED HEAD QUICK CHANGE ENGINE LATHE

Sturdy and honest in every line, devoid of gadgets but completely equipped for every modern production requirement, you'll find this Porter-McLeod 16" Geared Head Screw Cutting Engine Lathe the answer to the problem of fast, economical machining on your re-conversion work. Available in 6, 8 or 10 ft. lengths. Bed made from semi-steel casting, specially constructed and assembled to assure permanent alignment under even the heaviest cuts. Spindle is chrome nickel steel, forged and bored from solid, mounted on Timken roller bearings. Twelve spindle speeds, 15 to 500 RPM. You'll find this lathe the equal—in speed and accuracy — of machines requiring a larger initial investment.

Write for bulletin giving complete data and specifications and detailed illustrations of parts.

MACHINE TOOL COMPANY

PORTER-McLEOD MACHINE TOOL CO., INC., HATFIELD, MASS.

HIGH *Quality* in HIGH *Volume*

is Here To Stay...

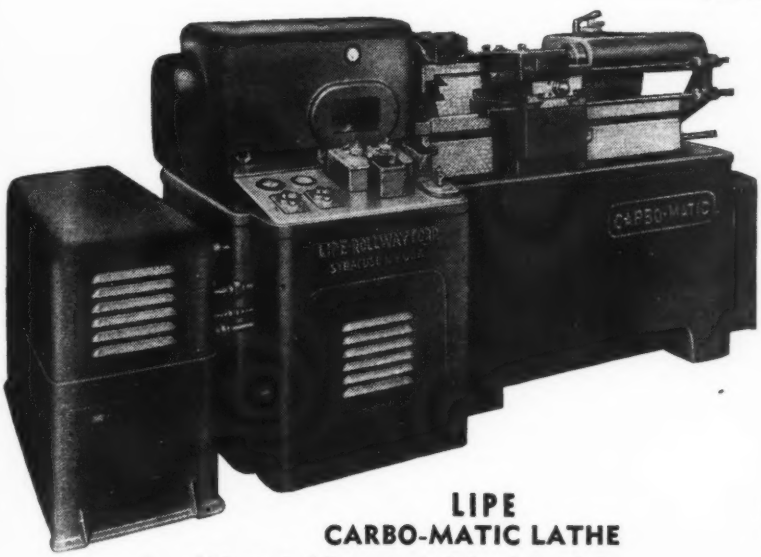
That's Why You Still Need...

LIPE LATHES

Maybe you thought some of the wartime tolerance and allowances were fussy—a waste of time and money. But if they erred, they erred on the right side—the record of American armaments proves that. More—your competitors have learned how to turn out that high precision in high volume, at a price. And they're not going to stop now. Chances are they'll try to produce and sell *still finer limits*.

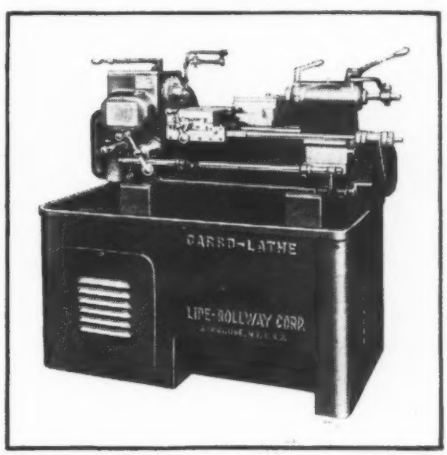
Your best competitive answer is to beat them to the punch. Check over your own lathes. How do they match up . . . in output? . . . in finish? . . . in tool wear and breakage? . . . in scrap losses and rejects? . . . in unit cost? Are they capable of maximum cutting speeds on high-Brinell steels, non-ferrous metals and plastics? What do they offer in the way of labor-saving improvements . . . in automatic operation?

If there is any doubt in your mind, call in a Lipe engineer. Let him show you how the Lipe Carbo and the Lipe Carbo-Matic will fit into your plans. It costs nothing to find out.



LIPE CARBO-MATIC LATHE

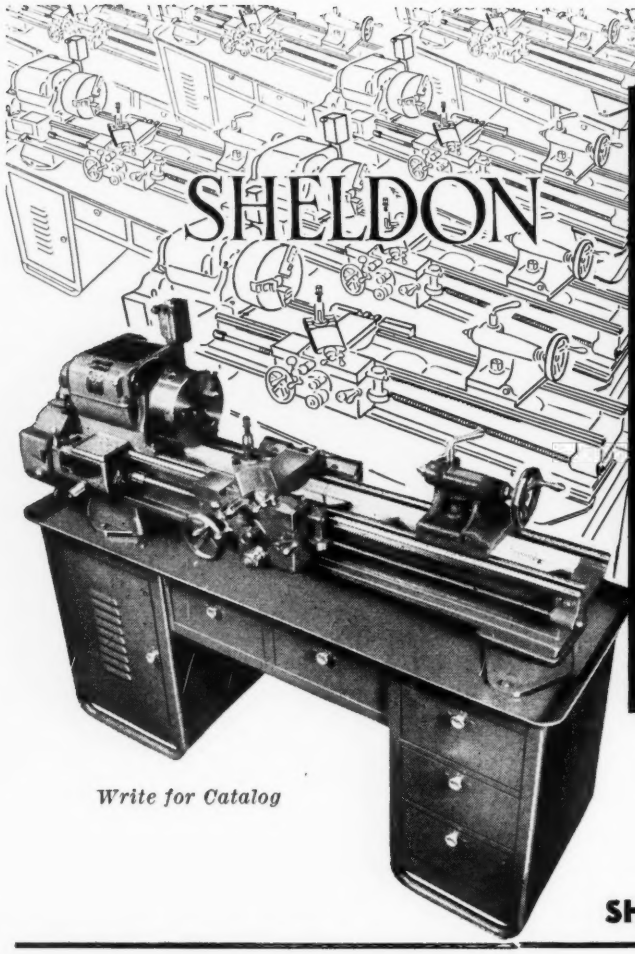
is a high-speed, fully-automatic lathe designed for battery operation by one operator. Hydraulic holding equipment, feeds, tailstock quill. Swing over bed 15", over carriage 8", between centers 30".



LIPE CARBO LATHE

has rugged massiveness for extreme rigidity . . . extra power for deep, fast cuts . . . and smoothness that reduces tool breakage and increases tool wear. Has the high spindle speeds required for efficient carbide-tool turning. Cuts range from 0.003" to 0.30". Swing over bed 12", between centers 18"

LIPE LATHES MADE BY LIPE-ROLLWAY CORPORATION, Syracuse, N. Y.



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only Volume Production

HAS MADE THIS QUALITY AT THIS PRICE POSSIBLE

The combined purchases of the Army, Navy, Marine Corps and Maritime Commission made the SHELDON S-56 possible. Chosen for the mechanized machine shop trucks and trailers, for instrument repair shops and as maintenance lathes for shipboard, these accurate precision lathes were produced literally by the thousands. The special and advanced tooling that made such unheard of production of quality machine tools possible, is now being employed to make SHELDON S-56 Lathes available for industry as a whole. Here is a lathe value never before considered possible—a moderate priced lathe with all the standard quality machine tool features, with the precision, capacity, stamina and handling feel of much more costly lathes.

The SHELDON S-56, today's greatest lathe buy, is sold through Industrial Distributors and selected Automotive Jobbers. A machine tool you should know about. For a description of its special features, write for "SHELDON S-56 Circular."

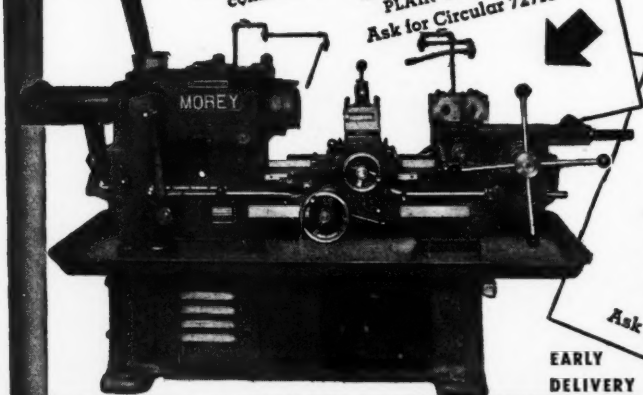
SHELDON MACHINE CO., INC. 4246 N. KNOX AVENUE CHICAGO 41, U.S.A.

MOREY TURRET LATHES

for BAR *or* CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL

For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM. constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A



2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

EARLY DELIVERY

- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS *MODERN* TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
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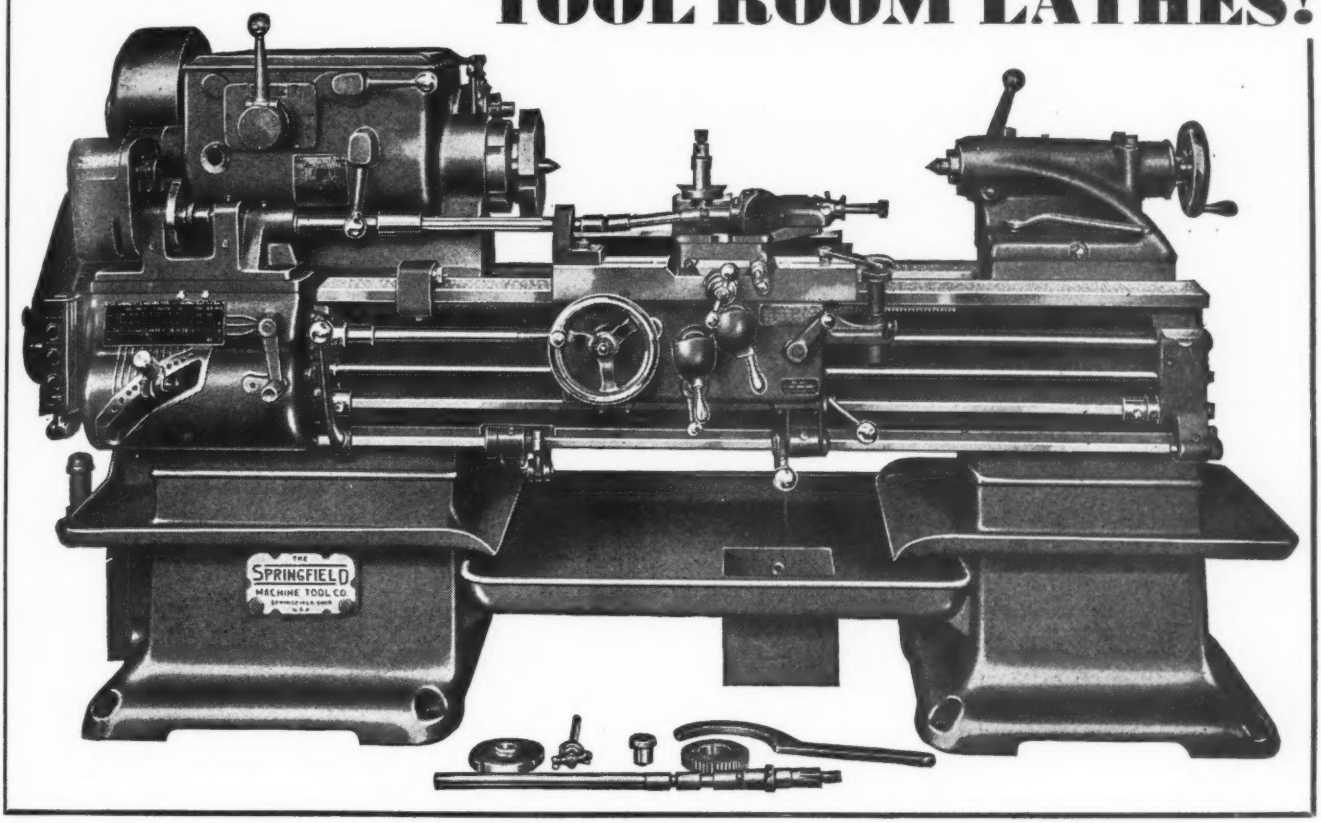
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

Choose SPRINGFIELD TOOL ROOM LATHES!



Here's why:

Bed is cast in our own foundry of a tough alloy with high wear resistance and strength, assuring elimination of internal strains and prevention of scoring and marring even under severe service. Compound rest sets firmly under heaviest pressures. Extra heavy semi-steel apron operates on best obtainable ball and bronze bearings. Lead screws are of high carbon steel, checked for accuracy to limits of .001" to the foot. Gears are of chrome molybdenum, hardened and ground for durability. Every other part of the Springfield Lathe—literally from the ground up—likewise represents superior design and construction. That's why Springfield Lathes are the choice of profit-minded production men in plants all over the country . . . men who know that the surest way to keep machining costs low is to utilize QUALITY tools that deliver dependable performance day after day and require minimum maintenance.

Springfield Lathes are built in sizes from 14" to 30"

Data and specifications are given in Bulletin 162, and a copy is yours without obligation!

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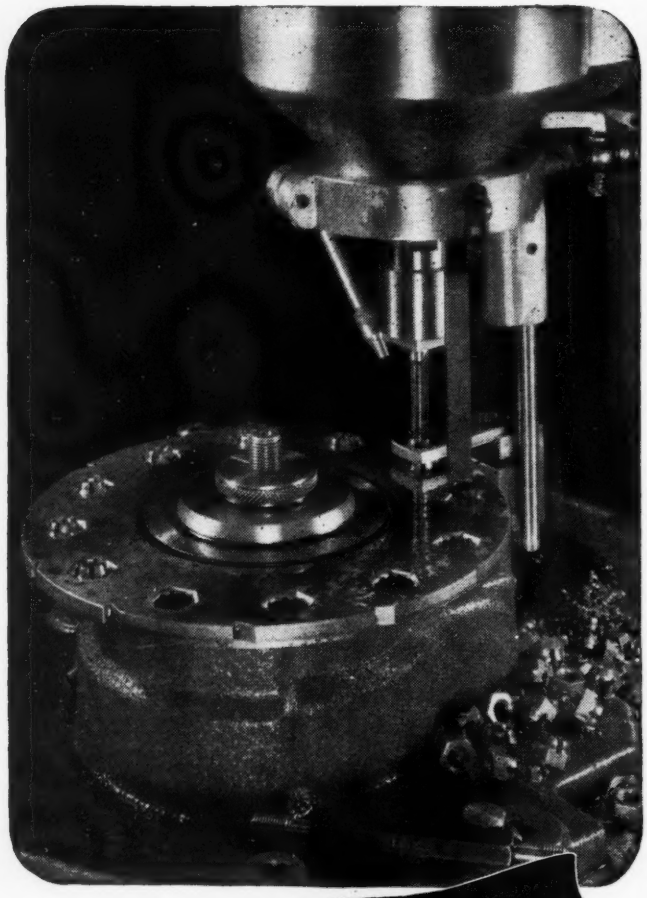
THE SPRINGFIELD MACHINE TOOL CO.
SPRINGFIELD, OHIO



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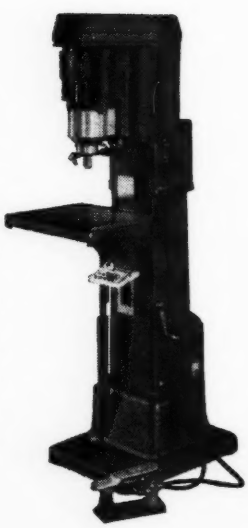
AIR CONTROL is the Secret of precision tapping The Haskins Way

Accuracy—to a class 4 fit when necessary—is constant—each part is tapped exactly like every other, independent of operator efficiency. AIR regulates the complete tapping cycle—not only the down stroke, but its control is so sensitive that the tap is allowed, in effect, to float out of the part. Tap life is longer—tap breakage practically eliminated. Send today for your copy of catalog on Tapping—The Haskins Way. R. G. Haskins Co., 618 South California Avenue, Chicago, Illinois.

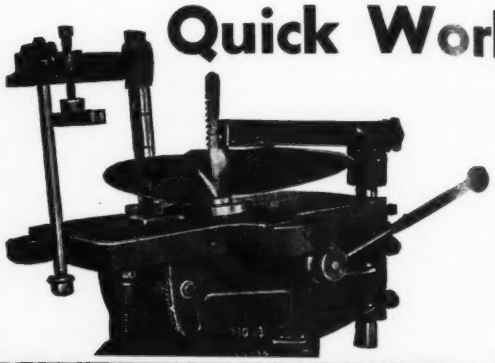


HASKINS

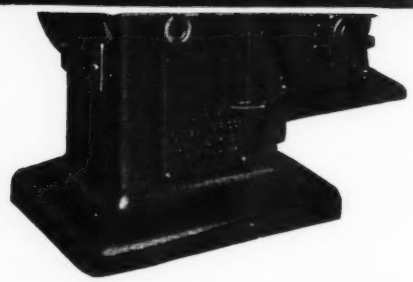
haskins

PRECISION TAPPING EQUIPMENT

Quick Work!



DAVIS KEYSEATERS



Few minutes for setting up, even on tapered work. . . . Rapid, multiple-tooth cutting action that makes a quick job of the largest keyways. . . . High vertical capacity that enables flat work to be stacked for simultaneous cutting. . . . These features make Davis Keyseaters an investment in speed that's worth while investigating. Write for bulletin.

DAVIS KEYSEATER COMPANY

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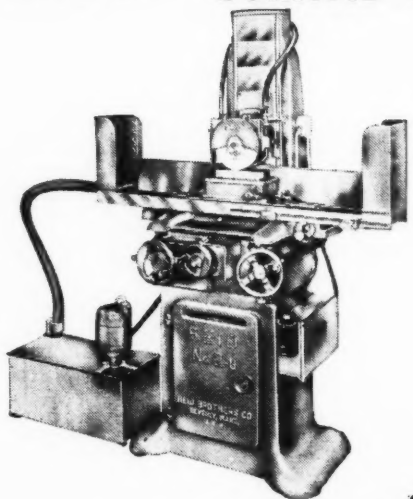
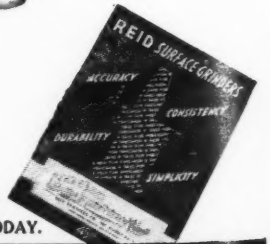
REID *Precision* SURFACE GRINDER



EQUIPPED FOR WET GRINDING

MAINTAINED ACCURACY WITH ECONOMY



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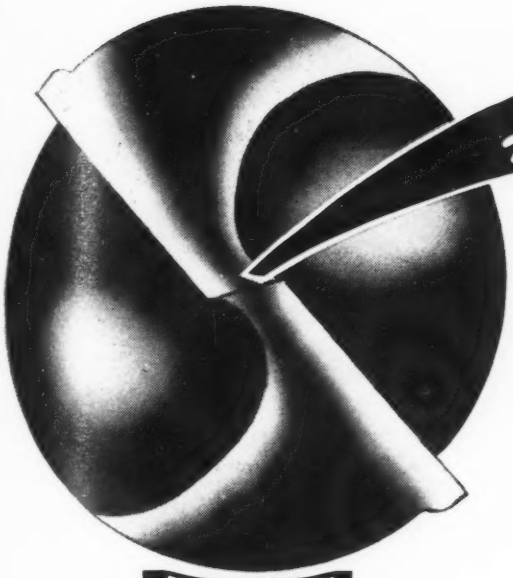

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FOR MORE HOLES FROM EACH GRIND

To get maximum production from drills, they must be sharp, correctly ground at the point. Oliver Drillpointer Sharpened Drills give balanced cut with each lip doing parallel work, giving longer life to both drills and drilling equipment — more holes from each grind means greater savings in equipment.

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Provides a point that gives greater clearance with less chisel point angle — thrust is reduced and uniformity maintained. Each drill point is precisely the same as every other drill point for multiple spindle drilling.

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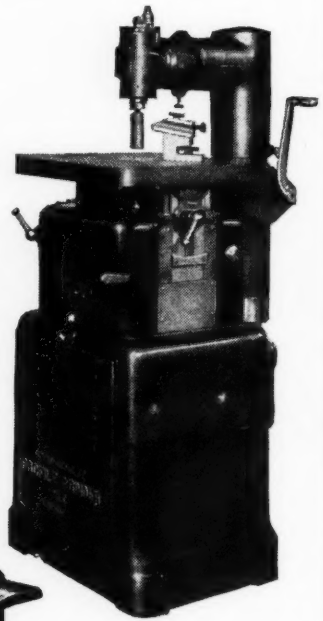
Precision Grinding

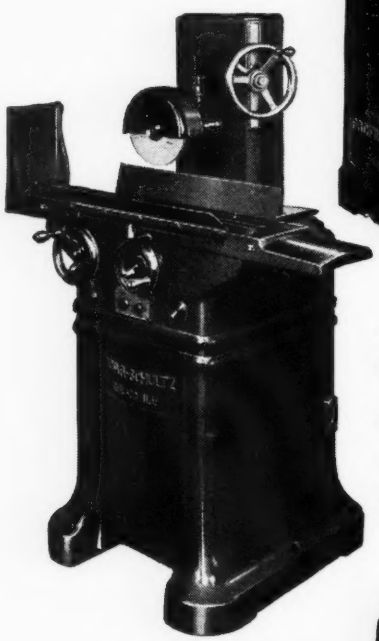
IN THE TOOL ROOM . . . IN PRODUCTION

Designed for the tool room and die shop where precision workmanship is all important . . . built with Boyar-Schultz quality, resulting in sturdiness that HOLDS accuracy, not only in tool and die work, but in production wherever accuracy is necessary.

No. 2 →
PROFILE GRINDER

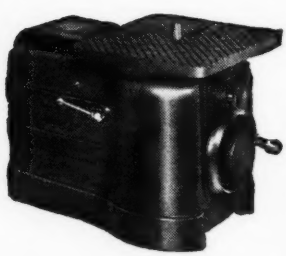
A large, floor model Profile Grinder with two independently powered spindles operating at 10,000 R.P.M. with vertical oscillations. Available also with single (lower) spindle only.





← No. 618
SURFACE GRINDER

A sturdy, easy operating Surface Grinder, designed for the tool room and built to give positive precision performance over long periods of time.



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PROFILE GRINDER

A bench size Profile Grinder. A time saver in grinding dies, punches, cams and templates. It is a rapid stock remover and operates at 20,000 R.P.M.

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Walnut St. at Hoyne **CHICAGO 12, ILL.**

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- for any required form
- for close tolerances
- for high finish

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Blade and chisel tools, cone shaped, pyramid type and other dressers with formed radii and specific included angles are available for these exceptional jobs.

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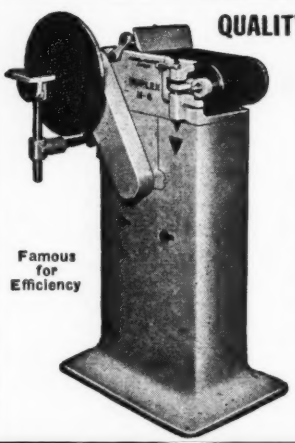
QUALITY • SERVICE • DEPENDABILITY



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HIGH SPEED BAND AND DISC GRINDER

The latest in pedestal type grinders. Actually two machines in one! 14" disc for all rough work . . . 6 x 48' band for finishing. Precision-built to post war standards.

Other styles and sizes in New Booklet on Finishing. Write Today.

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Super Finish Carbides — FAST!
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¼" WIDE $8.00—PER HONE—¾" WIDE $27.00
3 GRITS: 800 SIZE FOR SUPER FINISH
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PERFORATED SHEETS OF EVERY DESCRIPTION
Promptly made to your specifications—any size or style perforations, any metal, any gage or size sheet. Write us.
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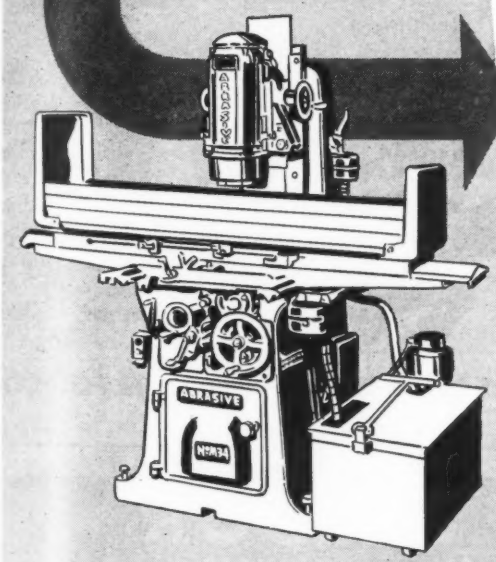
- NO "WARM UP" PERIOD FOR CLOSE TOLERANCE WORK
- EASE OF OPERATION
- RELIABILITY



Fully automatic No. M-34 Vertical Spindle Surface Grinder. Capacity: 24" longitudinal, 8" transverse and 12" vertical.

Write us for information on ABRASIVE Machines on the Government Machine Tool Surplus List . . . just send the machine serial number. Attachments, accessories and repair parts are also available.

ABRASIVE *has them all*

These factors, so essential for precision grinding on a production basis, are inherent in all ABRASIVE Mechanical Feed Grinders. Dependable and positive . . . with full shock absorbing qualities . . . ABRASIVE's Mechanical Feed has been time-tested and production-proved for superior grinding.

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THEY STAY TRUER . . . LONGER

High quality grinding becomes high economy grinding with VITRIFIED WHEELS. They stay truer—longer. They will not gum or glaze. And they are not affected by heat, cold, oils, or acids.

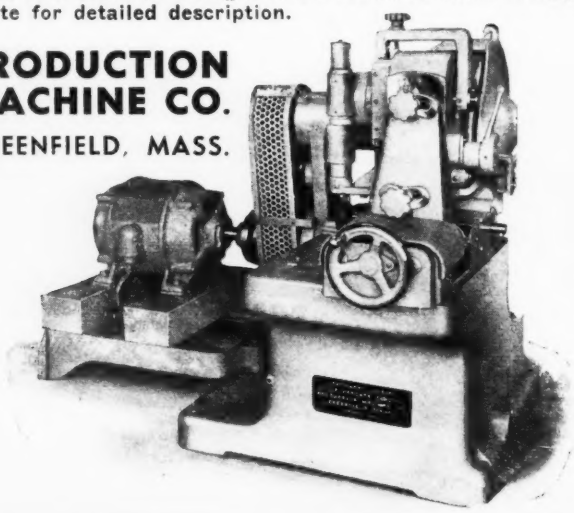
Let our engineers study your grinding jobs and make recommendations for greater service and economy. No obligations, of course.

VITRIFIED WHEEL CO.
WESTFIELD, MASS.

Faster Production on all types of CYLINDRICAL FINISHING!

Use just the wheel you want—at just the speed you want—to get just the finish you want on round tubes, rods, bars, etc. The NO. 101 CENTERLESS FEED POLISHING MACHINE finishes cylindrical work (¼" to 6" dia.) rapidly and economically. The patented Centerless Feed can be varied to feed at any rate—forward, reverse or neutral. Heavy wheel mounting, triple Vee belt drive and self-aligning ball bearings insure fine finishing. Swinging frame provides quick adjustment for wheels varying in diameter from 10" to 16". Built-in trueing device trues wheel while in motion. Write for detailed description.

PRODUCTION MACHINE CO.
GREENFIELD, MASS.



KEEP YOUR WHEELS TRUE!

DESMOND DIAMOND HAND TOOL

DESMOND HEX DRESSER

Keep production high, accurate and uniform with well-dressed wheels! Because we manufacture a **complete** line, including diamond tools and nibs, we can advise you impartially and correctly on your every need. Write for illustrated catalog.

THE DESMOND-STEPHAN MFG. CO.
URBANA, OHIO

BALDOR

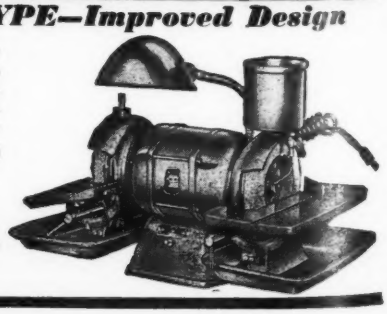
Special GRINDER for
CARBIDE TOOLS

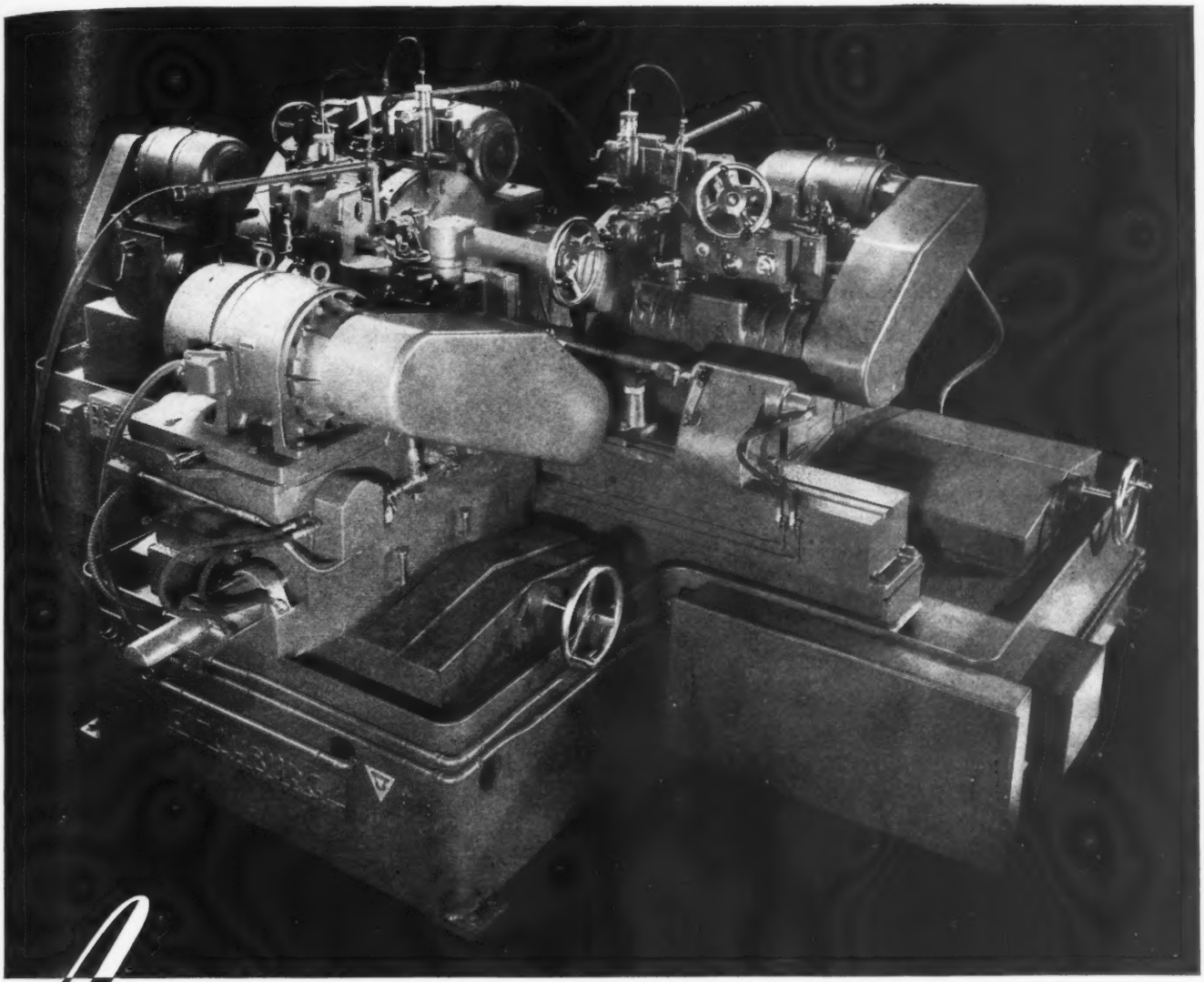
NEWEST TYPE—Improved Design

Precision-built for accurately and quickly sharpening Carbide Tools. Sturdy ½ h.p., ball-bearing, reversible motor. 6" Silicon Carbide wheels. Large, adjustable tool-rest tables..... **$110**

Ask for Bulletins on all BALDOR Grinders.

BALDOR ELEC. CO.
4400 DUNCAN AVE.
ST. LOUIS 10, MO.





Again THREE HEADS ARE BETTER THAN ONE

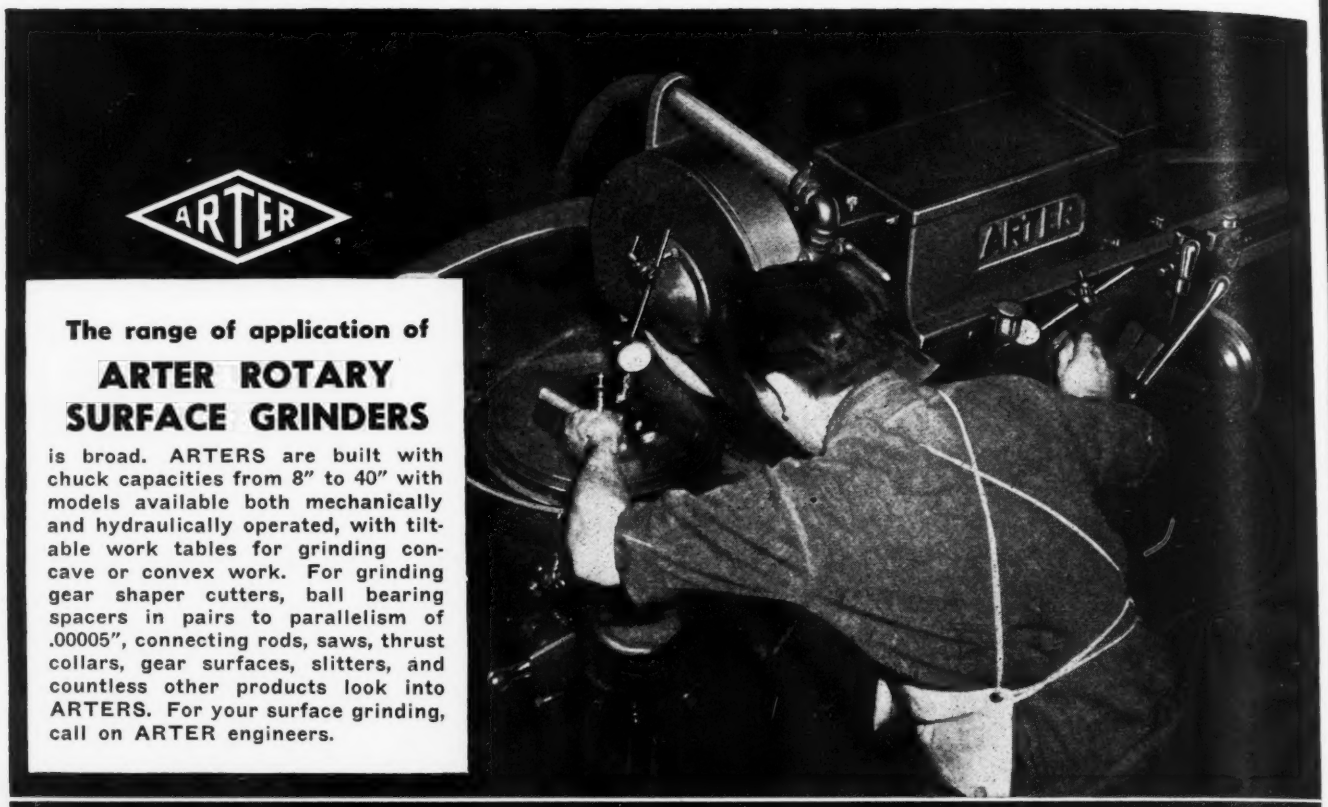
... Because Fitchburg engineers have combined three standard Bowgage Grinding Heads on a special base to plunge-cut grind three spottings on a 96" torsion spring for tanks. All three dimensions are ground at the same time—and within the time of the longest single grinding operation — and in one handling, with the consequent saving in time and reduced danger of spoilage.

Get the complete facts. The open engineering mind instantly makes a favorable comparison between Fitchburg automatic precision grinding and any other equipment on the market! Install the Fitchburg method now and use your "Head" to cut costs and speed production.

Send your blueprints for our engineers' recommendations. There will be no obligation.

A triple-head Fitchburg Grinder like this may be converted into one double-head grinder and one single-head grinder, or three single grinders. Heads are interchangeable — save your investment.

FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U. S. A.
Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders.



The range of application of

ARTER ROTARY SURFACE GRINDERS

is broad. ARTERS are built with chuck capacities from 8" to 40" with models available both mechanically and hydraulically operated, with tiltable work tables for grinding concave or convex work. For grinding gear shaper cutters, ball bearing spacers in pairs to parallelism of .00005", connecting rods, saws, thrust collars, gear surfaces, slitters, and countless other products look into ARTERS. For your surface grinding, call on ARTER engineers.

ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.

GRIND CARBIDE & CAST ALLOY CUTTING TOOLS AT 5-20 TIMES LOWER GRINDING COST

BUXITE PROCESSED

A NEW HARDENER ADDED TO GRINDING WHEELS
REDUCES WHEEL WEAR
AFFORDS COOLER CUTTING.
BETTER FINISH, LONGER WHEEL LIFE
MAKES GRINDING EASIER

BuXite—developed through long research, and brought to completion by the exacting needs of war work, is a method of hardening all types of grinding wheels. The BuXite Process coats the grain of the wheel, and, under the pressure and heat of grinding, this coating changes into a "case" hardening that is comparable to diamond hardness.

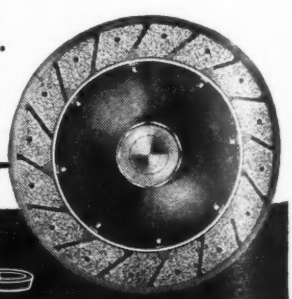
With BuXited wheels, sintered carbide and other superhard metals and alloys can be successfully ground under ordinary shop conditions—and with remarkable economy in tool life, due to improved finish, cleaner grinding, and elimination of excess heat. BuXited wheels grind the shank and the carbide at the same time without "loading" —saving extra operations.

BuXited wheels give equally good results on tool steels, cast iron, brass, all metals—in precision and form grinding and in snagging. In snagging, the increased production speed which is possible requires less dressing, resulting in more work with less effort.

BuXite is now available in all "Bridgeport" wheels. Consult us on your grinding problems. Share in the benefits from this greatest single advance in grinding wheel practice in the last 25 years!

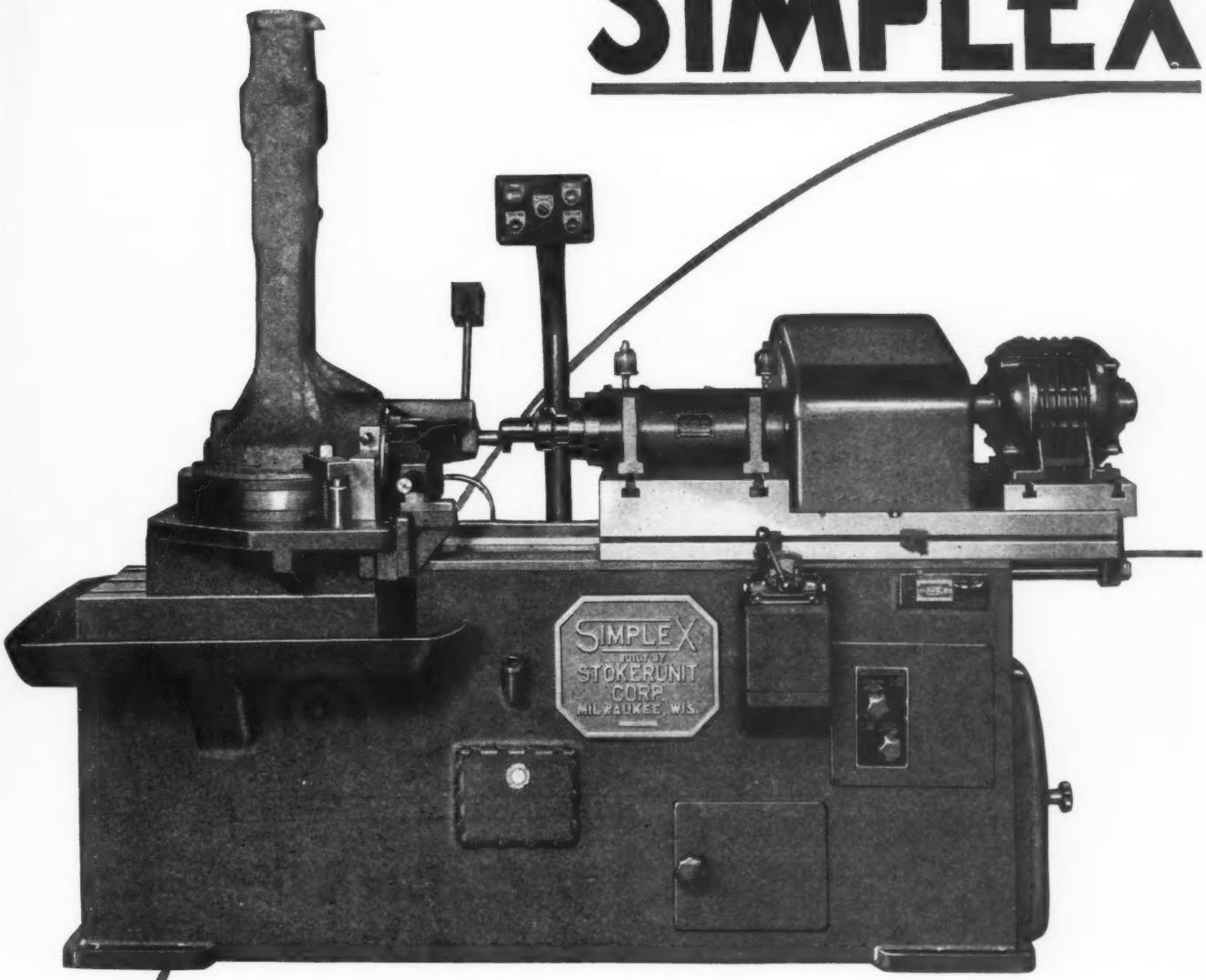
THE BRIDGEPORT SAFETY EMERY WHEEL CO., INC., BRIDGEPORT, CONN., U.S.A.

Bridgeport



GRINDERS • GRINDING WHEELS • BUFFING LATHES

SIMPLEX



Bulky and awkward pieces are difficult precision boring jobs. Couple this with the necessity of locating from previously machined surfaces and for handling several sizes and types of pieces in the same fixture and you have a boring problem.

This SIMPLEX 2U Single-end Precision Boring Machine was tooled for pinion bearing bores in rear axle sections and it was necessary to locate from the differential joint surface and the previously finished face on the boss. The low base of the machine made it possible to use an ample size fixture without raising the piece beyond a convenient operating height, and a dial indicator type gauge provided to give correct reading of the alignment was adaptable to all of the several pieces handled.

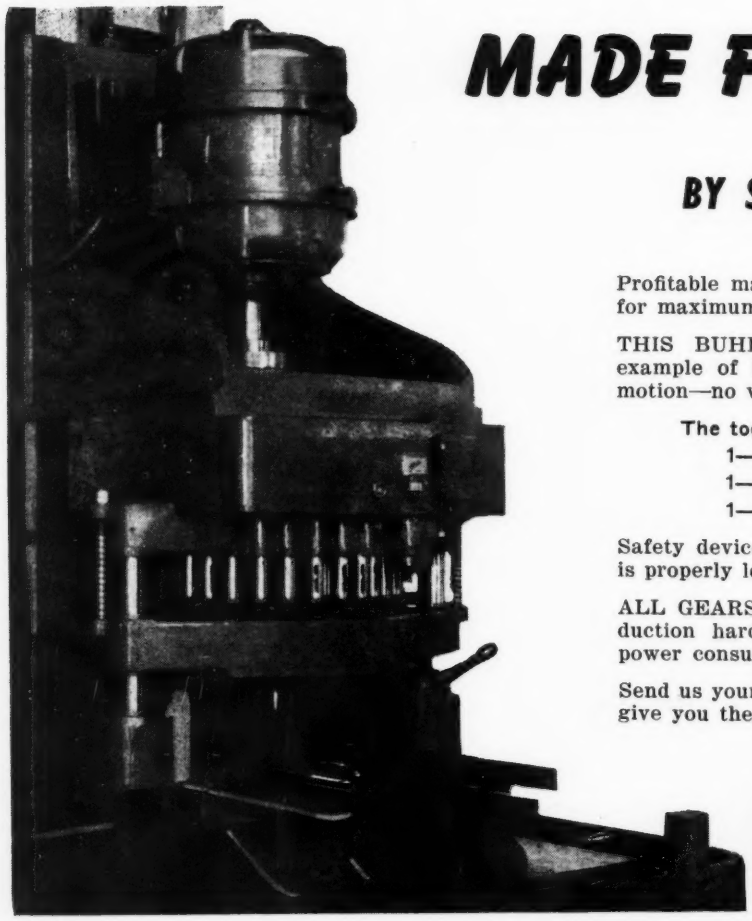
Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Machine Tools Division

4526 West Mitchell Street, Milwaukee 14, Wisconsin

Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools



MADE FIT FOR PROFIT

BY SOUND *Buhr* RETOOLING

Profitable mass production means equipment must be tooled for maximum hourly capacity.

THIS BUHR VERTICAL HYDRAULIC DRILLER is an example of Buhr engineering capabilities—there is no lost motion—no wasted efforts in operations.

The tooling by Buhr includes
1—41 Spindle Drill Head
1—Bushing Plate
1—Holding Fixture

Safety devices prevent machine from operating until fixture is properly located.

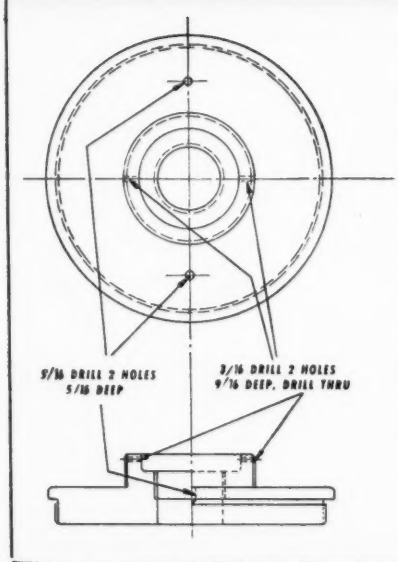
ALL GEARS IN BUHR DRILL HEADS are shaved and induction hardened for quieter, frictionless operation, lower power consumption, and more trouble free production hours.

Send us your blue prints or write about your problems. We'll give you the correct answer.

BUHR MACHINE TOOL CO.
843 GREEN
ANN ARBOR, MICH.

HOEFER *3-Way* DRILLING HEAD

MULTIPLIES CAPACITY OF PRESENT MACHINES IN PRODUCING BASE PLUGS FOR BOMBS

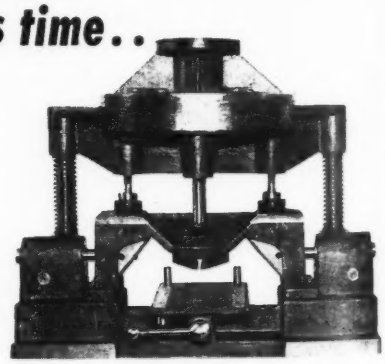


The main or 2-spindle head is driven by the drill press and has two splined drivers near its outer rim which, through bevel gears, drive the two horizontal spindles.

The feeding of all four drills—two vertical and two opposed horizontals—is accomplished by rack and pinion which are covered by the guards shown.

Instead of handling the drilling of the base plug for the four holes from three different directions, one pass of the driller spindle drills all four holes in 1/5 the previous time. Actual drilling time 6 seconds.

ONE PASS of the driller spindle drills all 4 holes in one-fifth the previous time..

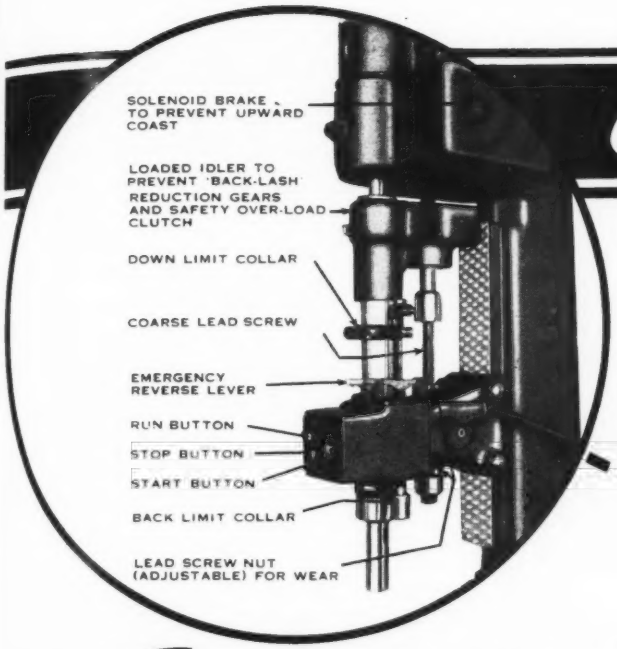


Hoefer Multiple Spindle Heads not only increase production per hour but decrease drilling cost per piece. In addition, they increase production from the same floor space, decrease handling time, and lessen operator fatigue. Through use of these drill heads you release needed machines for other work.

★ The use of Hoefer Multiple Spindle Heads on your present equipment will take care of any drilling requirement. When a part becomes obsolete because of re-design, you have only the inexpensive base or support on which the unit is mounted to discard—not the whole machine. Hoefer Heads were designed to meet the need for maximum flexibility and they do it efficiently and economically. Give us an opportunity to analyze your drilling problems—send us your blueprints and number of parts you need for one day. We can design a head that will speed your production, save handling time, and save the need for new costly drilling equipment.

Hoefer's Whole Business is Holes . . . .

HOEFER MFG. CO. *Freeport, Ill.*



Avey FEATURE No. 3

THE Avey TYPE MA-6

AVEY-MATIC POWER FEED HAND FEED AND REVERSING MOTOR TAPPING MACHINE

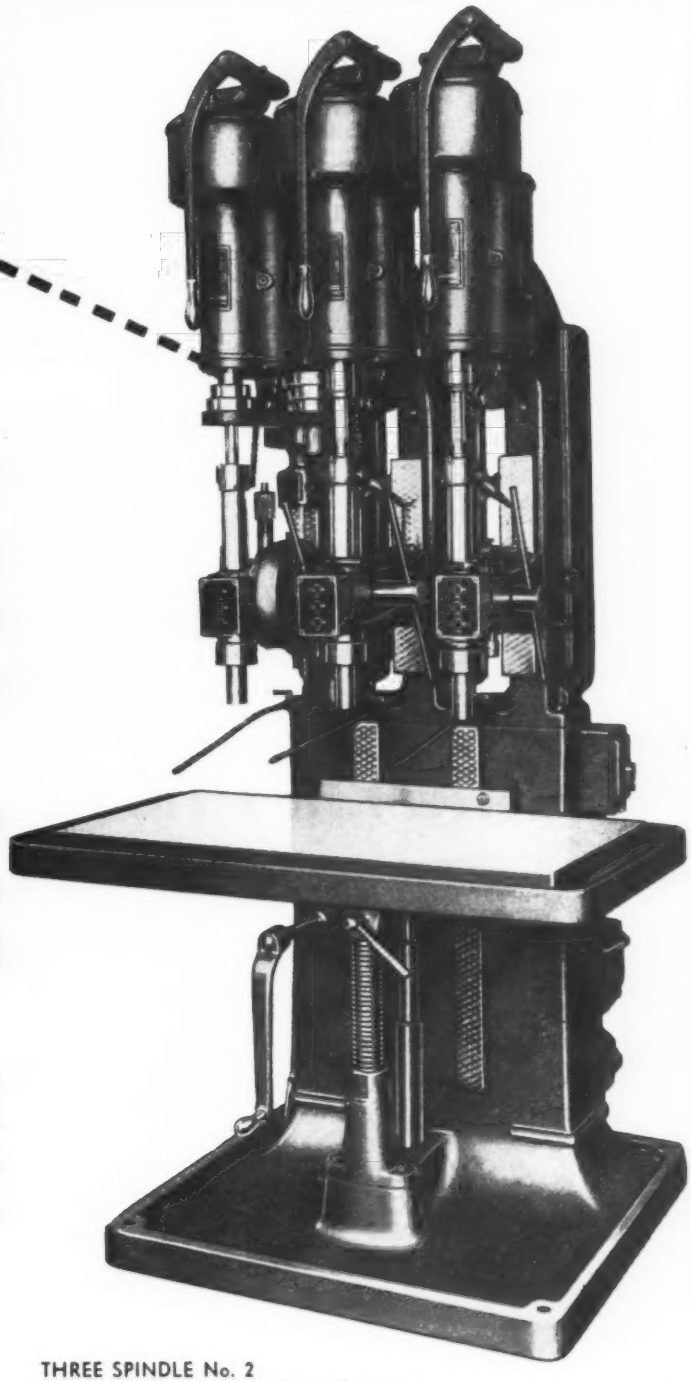
features

reversing motor, positive lead screw tapping — for accurate thread and tapping in soft material or thin sheets

Dog control for depth — maintaining accuracy of depth within one-half revolution of the spindle — or emergency relief lever used to reverse motor if necessary before tapping cycle is completed.

Type MA-6 is made in following capacities:
No. 2 — 7/8" capacity in cast iron.
No. 3 — 1 1/4" capacity in cast iron.

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.



THREE SPINDLE No. 2
TYPE MA-6 • COMBINATION MACHINE
1st Spindle - Avey-matic Feed
2nd Spindle - Hand Feed
3rd Spindle - Tapping (Reversing Motor)

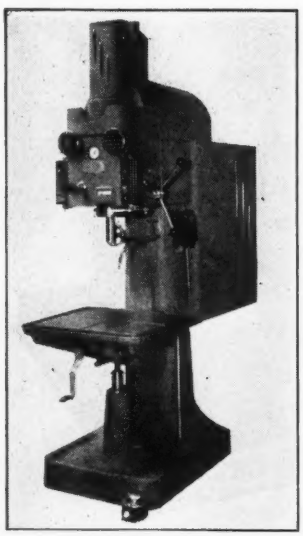
Avey DRILLING MACHINES
CINCINNATI · OHIO

CARLTON *Radials*

The Carlton Machine Tool Co. offers a complete line of Radial Drilling Machines in sizes ranging from 3′ arm to 12′ arm, and from 9″ dia. column to 26″ dia. column. Carlton Radials are delivering outstanding service in almost every large manufacturing plant in the country, as well as railroad shops, shipyards, steel mills, etc. Carlton all-ball-bearing construction with original low-hung drive to spindle makes operation—even under heavy loads — smooth, vibrationless and chatter-proof. Many other modern features available. For greater production, greater economy and satisfaction . . . . investigate Carlton Radials today!

THE CARLTON MACHINE TOOL CO.
CINCINNATI, OHIO

Better TAPPING Faster



on a Model DB
CLEVELAND Automatic Tapping Machine

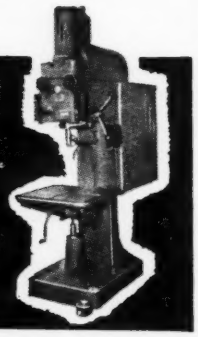
Give your tap a chance to produce better threads. Our lead screw completely controls the thread accuracy through the entire tapping cycle, taking the load off the tap—Class 3, 4 and 5 gauge fits are therefore being produced on a production basis

Five Outstanding Features

- LEAD SCREW CONTROLLED
- 100 PER CENT AUTOMATIC
- PRECISION DEPTH STOP
- SENSITIVE SLIP CLUTCH
- SPLIT SECOND REVERSE

Full Descriptive bulletin available. Write for your copy today.

CLEVELAND
LEAD SCREW
TAPPING MACHINES

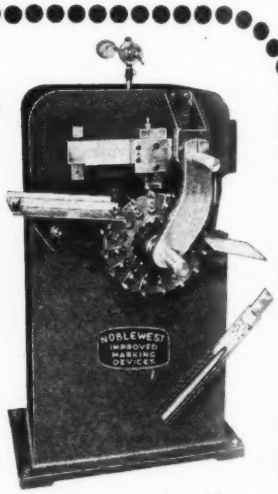


★

THE CLEVELAND TAPPING MACHINE CO.
3610 SUPERIOR AVE., CLEVELAND 14, OHIO

save time!

We solve marking problems quickly



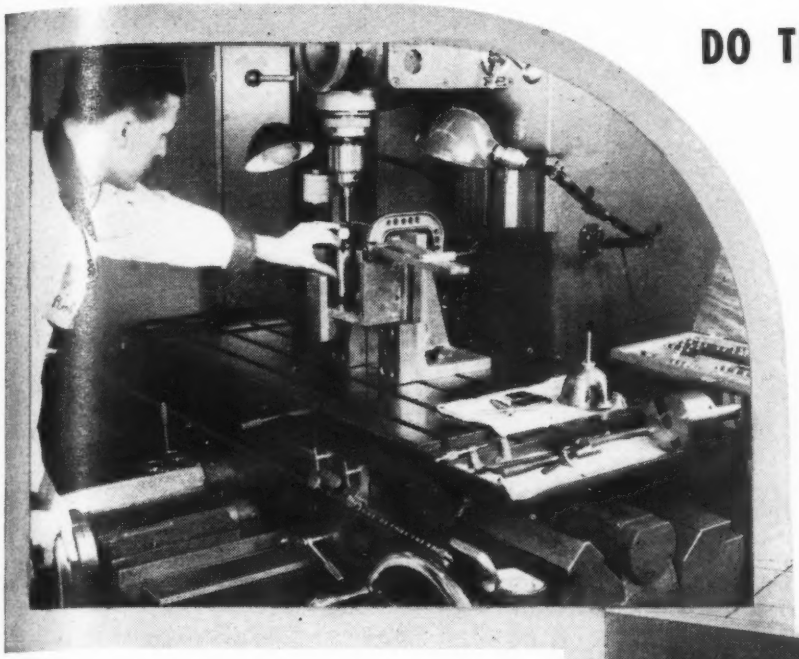
Let "marking specialists" solve your special marking problems—quickly, efficiently, economically. Regardless of size, shape or material, we can supply equipment that will speed your marking, cut your costs. Send your blueprints today for analysis.

NOBLE & WESTBROOK MANUFACTURING CO.
Marking Specialists Since 1904
EAST HARTFORD, CONNECTICUT

- Model 149 tooled to mark taps with pneumatic uniformity. Completely automatic operation.

MARK IT BEST WITH NOBLEWEST®

NOBLEWEST IMPROVED MARKING DEVICES



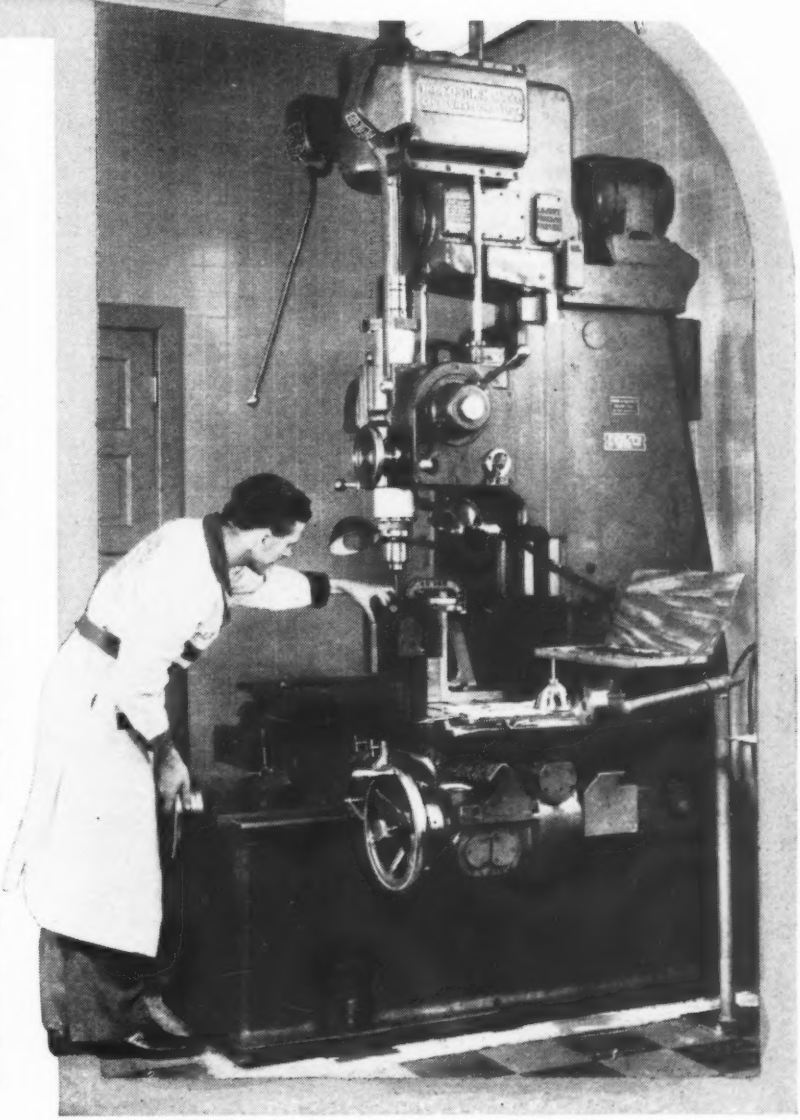
DO THE PRECISION JOBS

• *faster*

• *more easily*

ON A

FOSDICK JIG BORER



• Fosdick Jig Borers are being used extensively in the Tool Rooms and in Tool and Die Shops throughout the country because of their ability to perform precision drilling, reaming, boring, facing and similar operations accurately – quickly – without the use of specially trained operators.

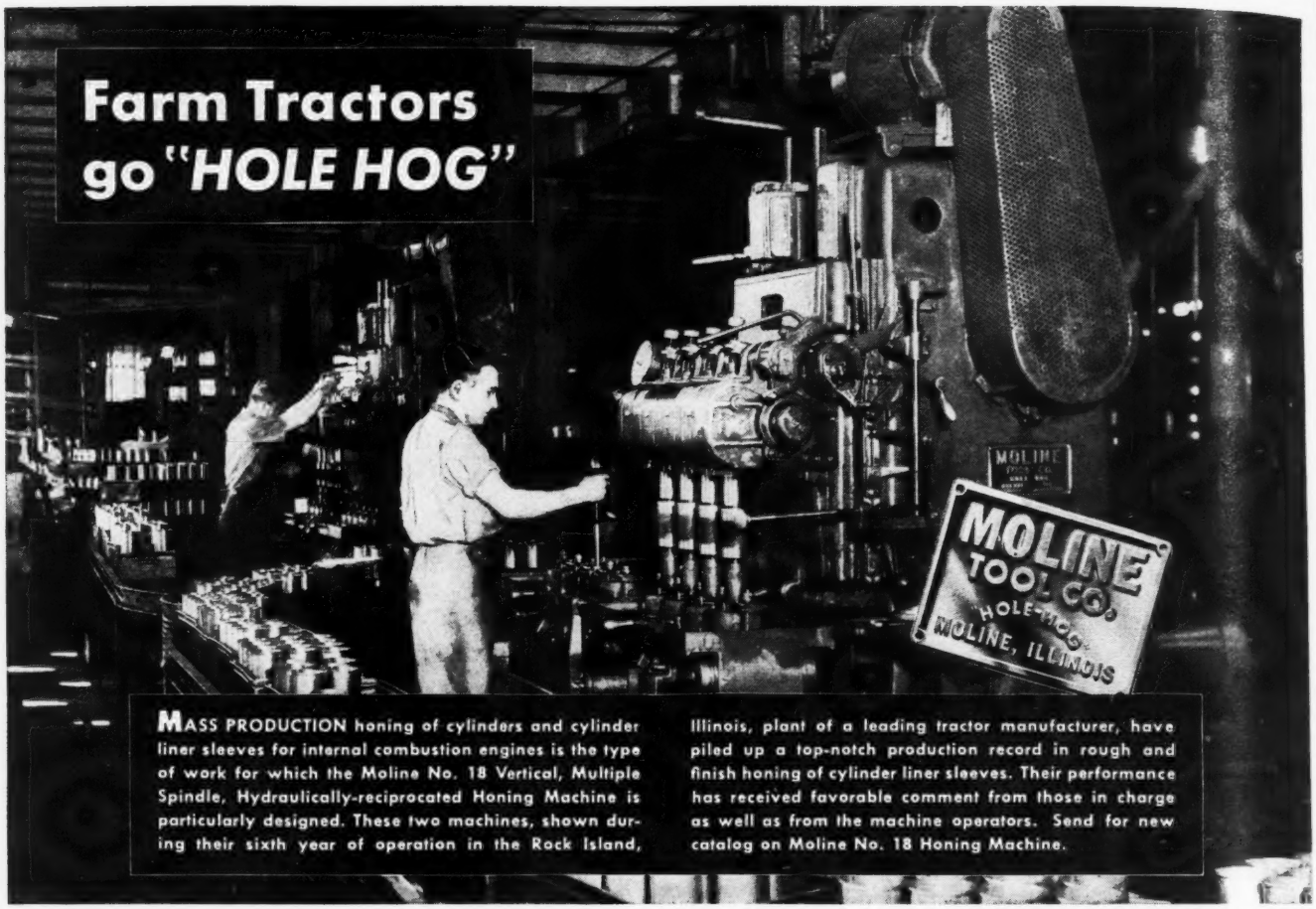
Above and right, typical "shots" of a Fosdick Jig Borer in action, in this instance boring three 1-1/8" holes in a welded construction fixture to tolerances of plus or minus .0002".

An additional advantage – you can put many short-run jobs on this machine and save the cost of expensive jigs or fixtures. Then, too, the initial cost of the Fosdick Jig Borer is considerably less than heavy machine tools often used to obtain the same degree of accuracy.

Fosdick Jig Borer Bulletin "J. B. M." gives detailed information and illustrates several typical installations. Write for it today. And feel free to consult Fosdick engineers – without obligation – on your precision boring, drilling, tapping and similar work.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23. . . . OHIO

Farm Tractors go "HOLE HOG"

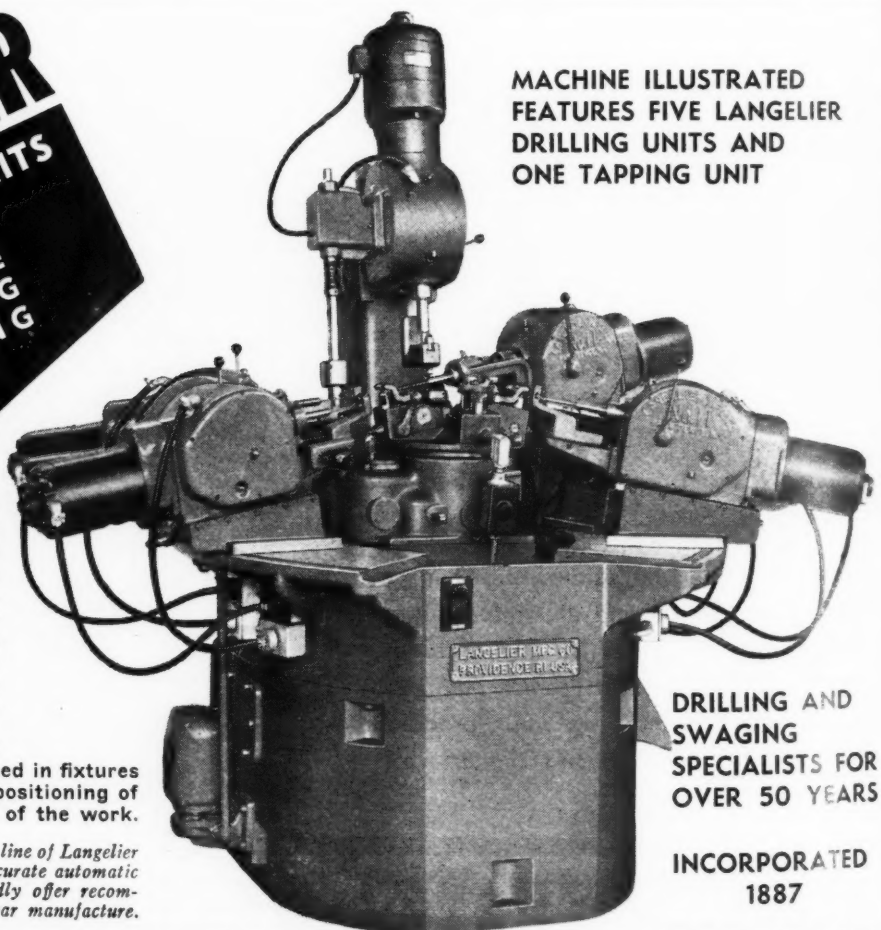


MASS PRODUCTION honing of cylinders and cylinder liner sleeves for internal combustion engines is the type of work for which the Moline No. 18 Vertical, Multiple Spindle, Hydraulically-reciprocated Honing Machine is particularly designed. These two machines, shown during their sixth year of operation in the Rock Island, Illinois, plant of a leading tractor manufacturer, have piled up a top-notch production record in rough and finish honing of cylinder liner sleeves. Their performance has received favorable comment from those in charge as well as from the machine operators. Send for new catalog on Moline No. 18 Honing Machine.

Photo Courtesy International Harvester Company

LANGELIER
AUTOMATIC UNITS for MULTIPLE DRILLING TAPPING ETC.

MACHINE ILLUSTRATED FEATURES FIVE LANGELIER DRILLING UNITS AND ONE TAPPING UNIT



Langelier Automatic Units are ideally suited for single or multiple applications in the building of Special Machines (as illustrated here) for high production drilling, tapping, milling, counterboring, reaming, spotting, chamfering, etc. Multiple Spindle attachable Langelier Heads may be mounted on the feed sleeve of each Unit for combinations of these operations. The entire Machine, as illustrated, is electrically interlocked for fully automatic operation and central control. Work is locked manually, clamped in fixtures on a 4-station dial. Note the 10° angle positioning of the fixtures to permit drilling into rear of the work.

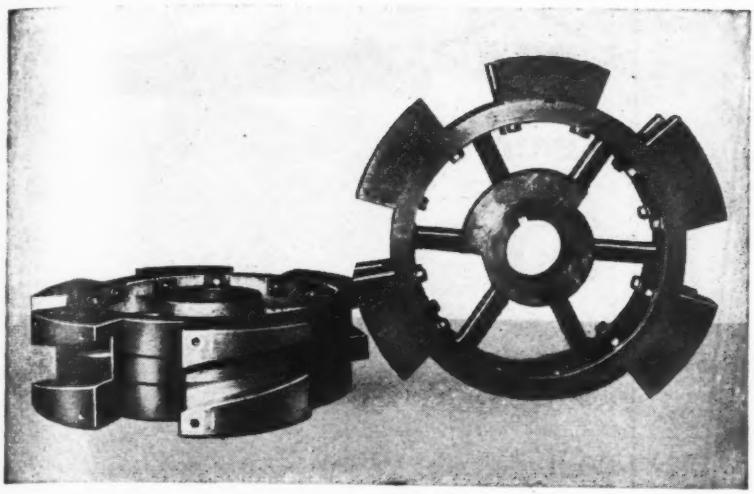
Write for all Langelier Bulletins describing the full line of Langelier Automatic Units and Machines for high speed, accurate automatic operation. Our engineering department will gladly offer recommendations for immediate applications to post-war manufacture.

DRILLING AND SWAGING SPECIALISTS FOR OVER 50 YEARS

INCORPORATED 1887

LANGELIER MANUFACTURING COMPANY, PROVIDENCE, RHODE ISLAND

Rowbottom for Cams

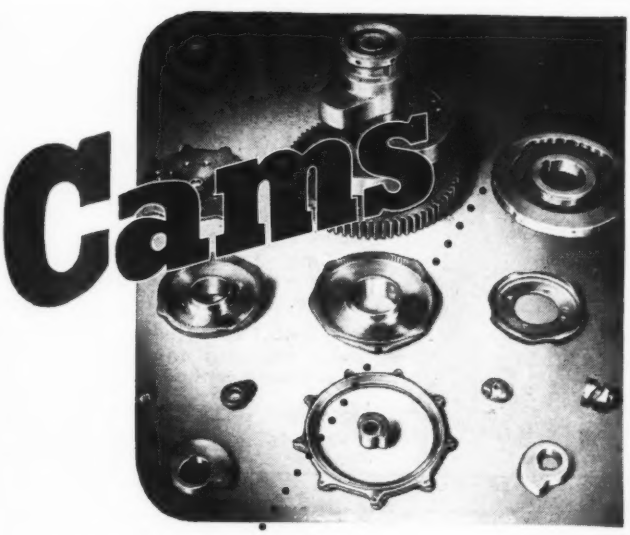


of Every Type and Size

Cams—and cams only! That is why it pays to let Rowbottom handle your problems of cam design and production. Our entire facilities are devoted to cam manufacture only and our experience in this particular field makes Rowbottom the logical choice whenever you need cams.

● The cam illustrated—made of interchangeable steel segments—is an example of Rowbottom service in designing and manufacturing cams for unusual applications. For every cam, whatever the material, size, type, or function, get Rowbottom estimates first!

THE ROWBOTTOM MACHINE CO., Waterbury, Conn., U. S. A.

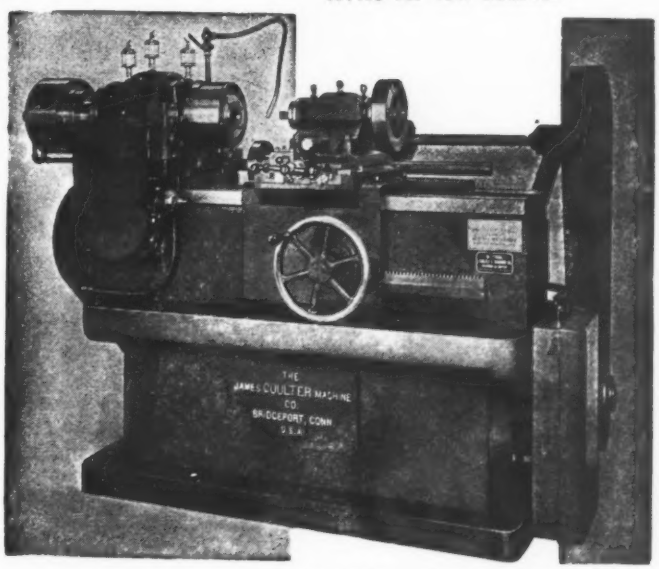


● **25 YEARS** of experience in making special cams for thousands of companies has made us experts at cam cutting and grinding. Our facilities and equipment, the most complete of any plant in the country, permits us to manufacture any style or size of Cam, Geneva Motion, or Scroll Plate in quantities of 1, 10 or 10,000. Accuracy can be held to split thousandths, and surfaces to micro-finishes. Send us specifications or blueprints and we will be glad to submit a detailed quotation to you on your requirements.

KUX MACHINE COMPANY
3924-44 WEST HARRISON STREET · CHICAGO 24, ILLINOIS

Thread Production at Wartime Speed!

Thread production—internal or external, right or left hand—through automatic, cam-controlled action! In the Coulter Type H Hob Thread Miller work and cutter spindles are individually motor-driven, permitting high output on any type of work that can be chucked. Maximum external thread, 7"; minimum internal thread depends on size of hob. Write for full details.



JAMES COULTER MACHINE CO.
Bridgeport, Conn.

NO. 2

American

MILLING MACHINE

Features

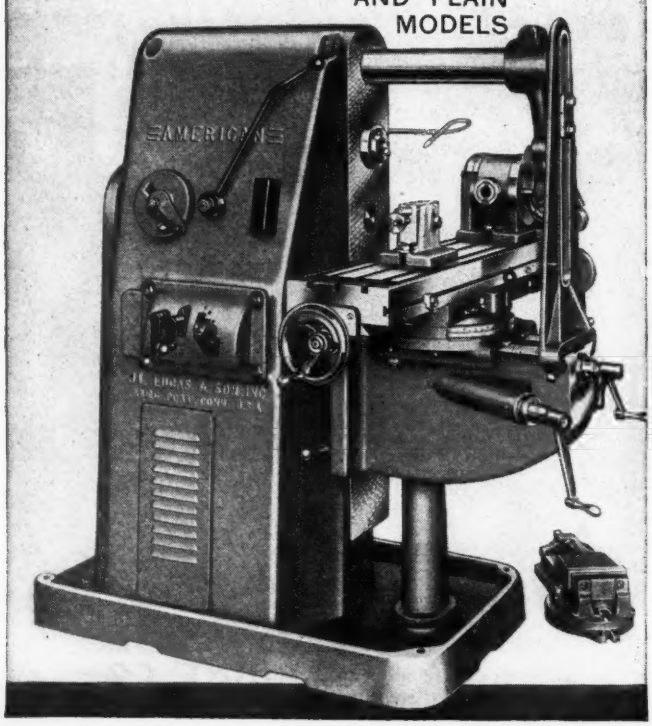
- Infinite spindle speeds. 25-500 RPM.
- Standard spindle nose, No. 40 taper.
- Motor-in-base drive. U. S. Vari-Drive Motor. Twin-Disc Duplex Machine Tool Clutch.
- Heavy, rugged column, 3-point structure, close grained gray iron, high steel content.
- Conveniently located controls.
- Every feature for modern milling requirements.

Manufactured and Sold by

J. L. LUCAS & SON, Inc.

BRIDGEPORT, CONN., U. S. A.

UNIVERSAL AND PLAIN MODELS



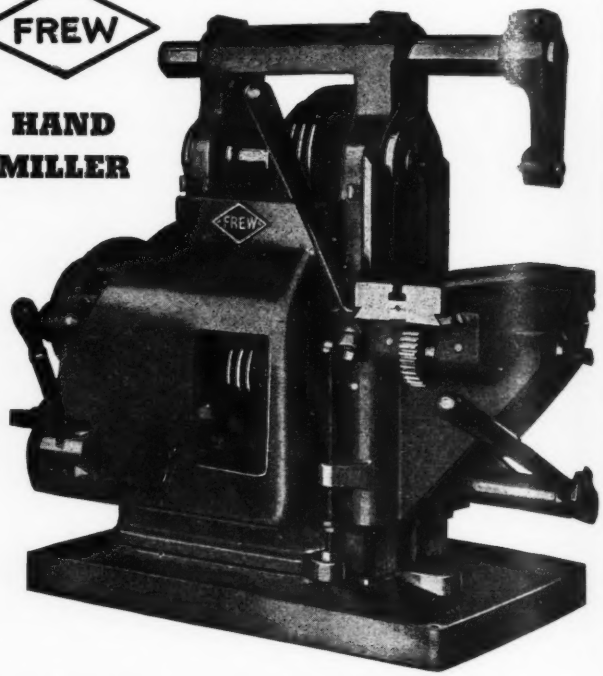
BETTER Small Part Production

with THE

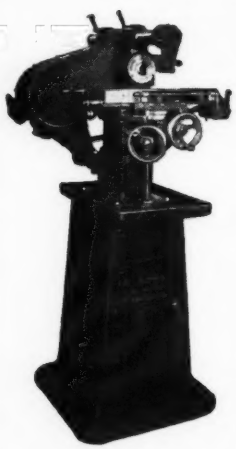
Get better production and release larger machines for large work! Use the FREW Hand Miller for accurate, economical production of small parts. Heavy construction and "big machine" features guarantee accuracy on heavy cuts. Table size 16¾" x 5¾" makes a wide range of work possible. V-belt drive and Timken-equipped spindle assure smooth operation at all speeds.

FREW

HAND MILLER



THE FREW MACHINE CO. 121 E. LURAY ST. PHILADELPHIA 20, PA.



BURKE

MILLING MACHINES and ATTACHMENTS

Designed especially for the profitable handling of small and difficult work on a production basis. Burke Milling Machines are available in sizes Nos. 1, 2, 3, and 4, all motor driven.

Illustrated No. 4 Motor Driven Machine mounted on cabinet column. Write for complete details.

Burke Machine Tool Co.
297 E. 16th ST., CONNEAUT, OHIO

JONES MACHINE TOOL WORKS, Inc.

Manufacturers of

VERTICAL SHAPERS • SLOTTERS • STRAIGHT EDGES
VERTICAL BORING MILLS
HORIZONTAL BORING MILLS
SURFACE PLATES AND SPECIAL MACHINERY

King of Prussia, vicinity of **VALLEY FORGE, PA.**

LUCAS "PRECISION"

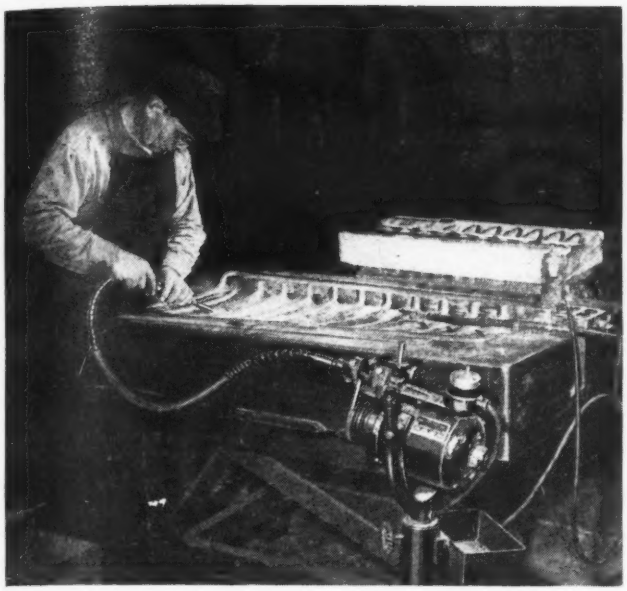
Horizontal Boring, Drilling and Milling Machine

THE LUCAS MACHINE TOOL CO.

CLEVELAND, OHIO, U. S. A.

NOW AND ALWAYS OF

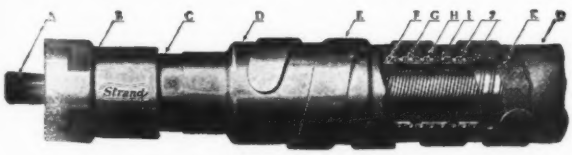
THE STRAND FLEXIBLE SHAFT MACHINE is the tool for this job!



• The work-piece is bulky and heavy . . . the problem is to remove cutter marks and bring depths and contours to micrometer dimensions, in order to assure perfect forming operations by the Kirksite die shown (plant of the Hydramatic Die Co., El Monte, Calif.) For such jobs, STRAND FLEXIBLE SHAFT MACHINES are ideal—their lightweight convenience and smooth, easily controlled power enable the operator to reach all surfaces of irregular work quickly, easily, with minimum fatigue . . . and to obtain a real precision finish. Strand Units and Flexible Shafts are made of top-grade materials and with careful workmanship. Guaranteed to give long, trouble-free service. Quickly tooled and retooled for grinding, sanding, polishing, buffing, drilling, reaming, rotary filing, nut-setting, screw-driving, etc. Send for Catalog No. 29 and let us help you select the proper equipment for YOUR requirements.

N. A. STRAND & Co., 5001 N. Wolcott Ave., Chicago 40, Illinois.

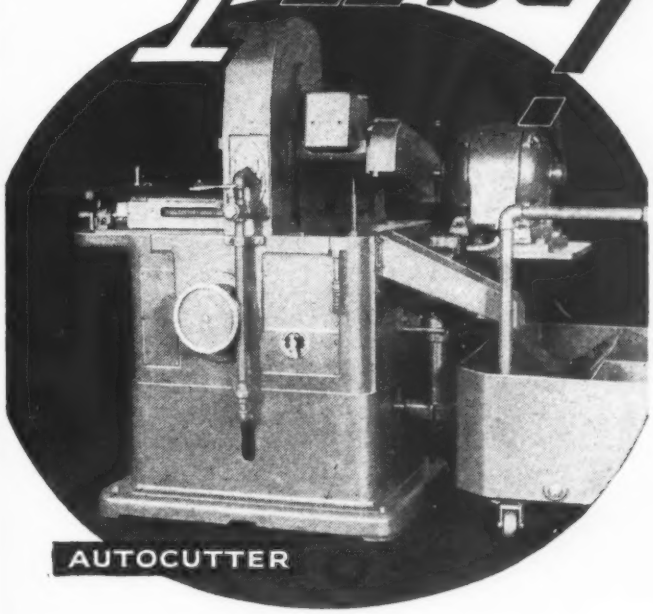
The "Inside Story" of STRAND Quality



DETAILS OF STRAND CONSTRUCTION

A—Core End. B—Swivel Coupling Nut. C—Tail Piece for Coupling Nut. D—Ferrule. E—Steel Reinforcement. F—Inside Liner. G—Wire Core Shaft. H—Asbestos Packing. I—Stop Wire. J—Metal Tubing Interlocking Joints. K—Metal Braiding. L—Vulcanized Rubber and Canvas Cover.

IT'S A First



Yes, this CAMPBELL "MODEL 700" is the first *fully automatic* abrasive cutting machine ever built. Coming from CAMPBELL, manufacturers of the most complete range of abrasive cutters, that's big news.

This "700" is "first" another way. It is the opening announcement of CAMPBELL'S post-war program of development, based on wartime improvements all through the line. Other announcements will follow.

Maybe there's a way a CAMPBELL ABRASIVE CUTTER could speed up or economize your production. It's easy to find out.

WHY NOT DO THIS?

Write and tell us (1) the range of sizes, (2) kind of material, (3) length of cutoff pieces, (4) length of stock before cutting, (5) tolerance for length of cut pieces and (6) hourly production requirement. With this information, CAMPBELL engineers can recommend production procedure and work up cost sheets for you.

Campbell

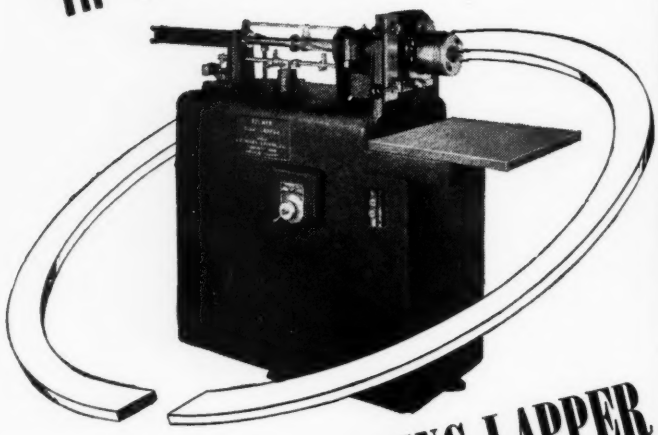
ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT

ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ACCO
AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

ELIMINATES GUESSWORK
In Fitting Piston Rings!



FULMER PISTON RING LAPPER

Only 10 to 25 strokes of the Fulmer Piston Ring Lapper will assure perfect contact of piston rings with the cylinder walls! There is no guesswork as to how rings fit the cylinders—you can *see* that they have a 100% bearing, *before the engine is built up!*

The Fulmer Piston Ring Lapper reduces "run-in" time from *many hours* to just a *few minutes.* It eliminates the need for tearing down the engine because rings do not "seat" properly. It assures peak performance — the engine can carry full throttle right from the start, with maximum power and proper control of lubrication.

Because of the great saving of time by lapping in rings and vastly improved engine performance, Fulmer Piston Ring Lappers are widely used throughout the world.

DEALERS: A few attractive territories remain open.

Write Today for Complete Information

C. ALLEN FULMER COMPANY
1236 First National Bank Bldg., Cincinnati 2, Ohio

FULMER

PRECISION PRODUCTION EQUIPMENT

ROD BORERS • HONING MACHINES • PISTON RING LAPPERS
CENTRIFUGAL CASTING MACHINES

Tannewitz
the DI-SAW with Extra SPEED AND EXTRA STAMINA

Did you ever hear of a transmission going haywire on a TANNEWITZ DI-SAW? No, neither did we, though we have been making die saws for a good many years. And that's just typical of the superior construction of the entire machine. It can take the severest kind of use and always be ready for the next job. Moreover the standard model has larger wheels than customary in machines of this type — a full 24 inches — for greater traction, straighter, faster sawing and more production. Get the complete facts and you'll discover why TANNEWITZ DI-SAWS always show the best possible return on an investment in equipment of this kind. Write for "DI-SAW" Bulletin.

OTHER MODELS TO HANDLE WORK OF ANY SIZE

for dies, jigs and other work too large to handle on the standard machine. Bulletin on request.

THE TANNEWITZ WORKS
GRAND RAPIDS 4, MICHIGAN

SAWS for ALL METALS

Huther Bros. make the saw for your work—for brass, copper, aluminum, steel. Correct pitch, correct tooth form, correct steels—all contribute to maximum speed and efficiency. Write for our catalog of saws for every metal cutting need.

Huther Bros. Saw Mfg. Co.
ROCHESTER NEW YORK

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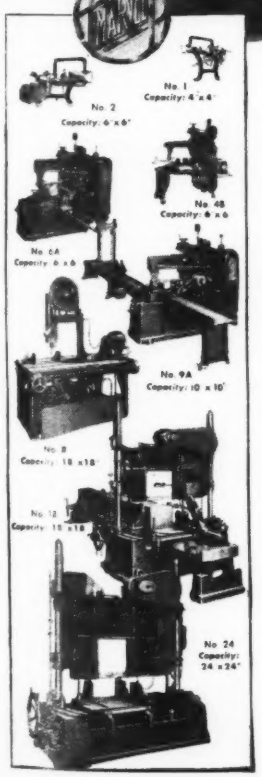
most VERSATILE most CAPACITY FASTEST

EACH *first* IN ITS CLASS



At the Braeburn Alloy Steel Corporation, Braeburn, Pennsylvania, there is a lot of steel to be cut—not only in tonnage but in types of steels, variety of cuts and range of sizes. Still the Braeburn Corporation can give prompt cutting-off service on any order, whether it be for a single tool steel flat, a thousand gear blanks or a giant die block (up to 18" x 18" cross section). They have equipped their cutting-off department to handle every type cutting-off job with a MARVEL No. 8 Metal-cutting Band Saw, by far the most versatile saw built; a MARVEL No. 9A Automatic Production Saw, by far the fastest saw; and, a MARVEL No. 18 Giant Hydraulic Saw—which, with the exception of its larger "sister" the MARVEL No. 24 (capacity 24" x 24"), is the largest capacity hack saw built. With this battery of modern sawing equipment this firm gets the utmost in Speed, Accuracy and Economy, no matter what the job calls for. Furthermore, because of the automatic features of these saws, one operator takes care of all 3 of them.

No matter what your sawing needs, from the most inexpensive dry cutting shop saw to the largest capacity giant, there is a MARVEL Saw exactly suited to your needs and it's the best saw of its type.

For quick reference see our section in Sweet's File—Mechanical Industries, or write for catalog.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 W. BLOOMINGDALE AVENUE CHICAGO 39, U. S. A.

Eastern Sales Office: 225 Lafayette Street, New York 12, N. Y.

MARVEL SAWS

Maintenance and Repair Men

Drill Those HARD-TO-GET-AT-PLACES with

STOW FLEXIBLE DRILL SHAFTS and ATTACHMENTS

Stow Flexible Drill Shaft with Std. Electric Drill

All drilling is more accurate and less fatiguing with a Stow Flexible Drill Shaft and Straight Spindle . . . and with Park heads you can drill in confined spaces not accessible to ordinary electric and pneumatic drills.

90° COLLET-TYPE HEAD

With a Stow Flexible Shaft and a Park 90 degree collet-type head, you can drill within 7/16" of angle corners with accuracy. Direct-geared spindle.

90° ANGLE HEAD

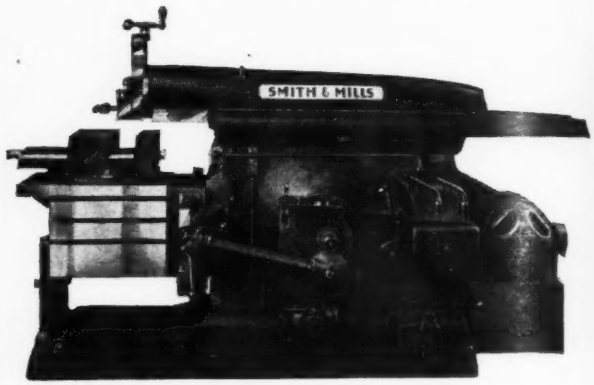
This Park 90 degree angle head has offset spindle and patented chuck. Drills within 1/4" of angle corners and other similar tight spots.

45° ANGLE HEAD

For especially close quarters use the Stow Flexible Drill Shaft with a Park 45 degree angle head. Takes any size drill up to No. 30.

STOW MANUFACTURING CO.
15 Shear St.
BINGHAMTON, N. Y.

DESIGNED FOR THE FUTURE TO PRODUCE FOR THE PRESENT

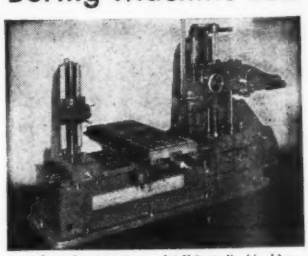


A Smith & Mills Shaper that gives you tool room accuracy on production jobs at the speed and ease of control you demand in the shop. Write for catalogue and specifications on all sizes from 12" to 32" stroke.

THE SMITH & MILLS CO.
CINCINNATI, OHIO

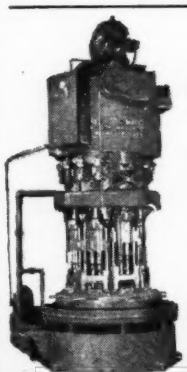
UNIVERSAL *Horizontal Boring Machine*
The only **TRIWAY** *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.



Vertical ROTO-MATICS

Multiple spindle drill heads and automatic clamping provide added production.

DAVIS and THOMPSON Roto-Matic

Continuous operation is essential for maximum production. VERTICAL ROTO-MATICS are continuous operating, multiple spindle, non-indexing machines that are adaptable to a wide range of machine problems. . . . *Bulletins 110 and 120* may help you solve your problems. Write for them.

Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. Milwaukee 14, Wisconsin

FOR LIGHT DRILL PRESSES
. . . A MORE EFFICIENT TAPPING HEAD!

Cross section of Tru-Grip Tap Holder showing positive drive to tap.

This special cover clamping model Procunier Tapping Head has been developed for most light drill presses. Removes weight of tapping head from bearings and drill press spindle. Rigid and accurate mounting is secured with fittings which clamp directly around the press quill. Other advantages include no overhang, no tap wobble, longer tap life, less tap breakage, and greater accuracy. Easily attached and removed. Thousands of shops report unusual production records with Procunier because these remarkable heads are built to stand up under the toughest production grind. The exclusive advanced design of the new Procunier Tapping Heads assures you accurate tapping at high speeds with automatic protection for taps! Tap is driven by a double-cone, cork-faced friction clutch which automatically regulates tap driving power by pressure applied through the drill press spindle. Operators can quickly detect full or loaded taps by the "feel", or pressure on the clutch, required to drive them, thus avoiding needless tap breakage. With this sensitive Procunier smooth operating friction clutch, bottom tapping is as simple as through tapping, since the clutch instantly slips should the tap strike bottom or stick due to tap loading.

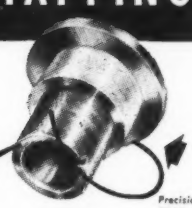
SEND FOR BULLETIN

giving full details, description and prices on complete line of Procunier Precision Tapping Heads to meet all needs. The new Tru-Grip Tap Holder—and also the full line of Procunier Universal Tapping Machines.

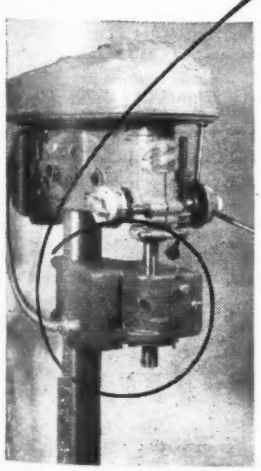
PROCUNIER
SAFETY CHUCK CO.
16 S. Clinton St. CHICAGO

PROCUNIER SAFETY CHUCK CO., 16 S. Clinton St., Chicago, Ill.
Send me bulletins on: ☐ High Speed Tapping Heads ☐ Tru-Grip Tap Holders ☐ Universal Tapping Machines.
Name.....
Address.....

LEAD SCREW TAPPING...
ON YOUR OWN DRILL PRESS!



Precision ground lead screw provides accurate, controlled tapping from 0-80 to ⅞"



With this ROTOREX tapping head you can convert your drill press to a precision tapping machine in a matter of minutes, and consistently produce Class III threads. To change to drilling, simply swing the ROTOREX to one side.

Employing the same principle as expensive tapping machines, the ROTOREX uses a precision ground lead screw for positive, automatic control of tapping leads and operates on a complete automatic cycle. It is rugged in construction, economical and can be operated with unskilled labor.

CHECK THESE FEATURES:

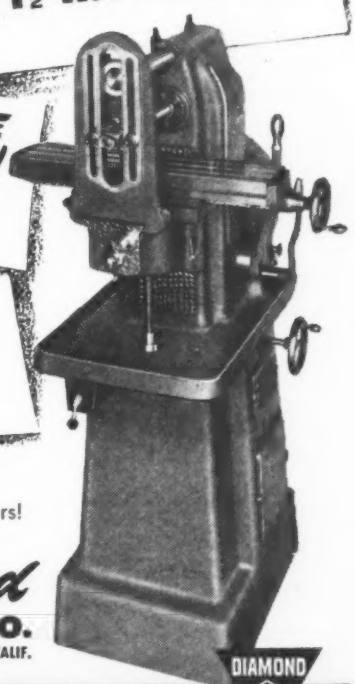
1. Positive, automatic control of lead.
2. Hardened, precision ground lead screws.
3. Instantaneous emergency reverse.
4. Complete automatic cycle.
5. Accurate control of depth—accuracy to .010.
6. Foot control frees operator's hand for loading.
7. Capacity 0-80 to ⅞"
8. Price complete, $175.00, F. O. B. factory.

$175.00

DOUGLAS ROTOREX PRECISION TAPPER

DOUGLAS MACHINERY CO., INC., 150 BROADWAY, NEW YORK 7, N. Y.

MODEL M-26 *Diamond*
PRECISION 1½ H.P. MILLER



DEPENDABLE PRODUCTION with economy of investment

IMMEDIATE DELIVERY! NO PRIORITY

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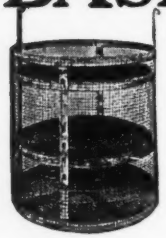
Diamond
MACHINE TOOL CO.
3422 E. OLYMPIC BLVD., LOS ANGELES 23, CALIF.

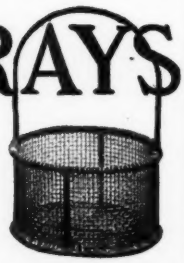
DIAMOND

Manufacturers of the DIAMOND Line of Precision Milling Machines and Accessories

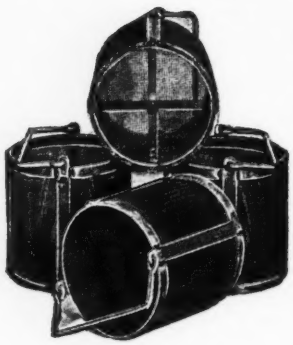
BASKETS TRAYS



WOVEN WIRE PROCESSING FIXTURES

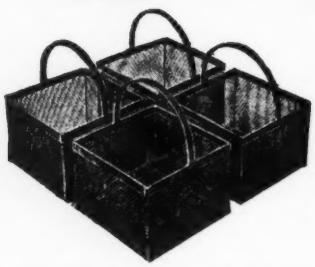


made to individual requirements—
all metals, weaves, styles, shapes.



We have been specialists for many years in the making of precision wire cloths, wire screens and woven wire products.

We apply our same precision principles in fabricating wire cloths into finished industrial units, for production or processing equipments or for permanent parts of countless industrial products.



We invite your inquiries for wire cloths of all commercial metals or alloys or weaves, in continuous lengths or cut to size, or processed to meet your individual requirements.

We will follow your specifications and blue-prints exactly as your production engineers have prepared them—or we will submit suggestions for your approval.

"Perfect" alloys and metals	"Perfect" Wire Cloth weaves	"Perfect" Wire Cloth processing	"Perfect" Wire Cloth products
Super-Loy	Arch-Crimp	Bending	Baskets
Steel	Coiled	Binding	Circles
Galvanized	Double-Crimp	Brazing	Cones
Tinned	Double-Fill	Calendering	Crates
Stainless Steels	Dutch	Clinching	Cylinders
Nickel-Chromium Alloys	Filter	Cutting	Discs
	Flat-Top	Dipping	Forms
Aluminum	Herringbone-Twill	Dishing	Leaves
Brass		Flanging	Lengths
High	Intermediate-Crimp	Flattening	Panels
Low		Forming	Pieces
Bronze	Rek-Tang	Framing	Racks
Commercial	Selvage-Edge	Galvanizing	Ribbons
Phosphor	Straight-Warp	Painting	Rolls
Copper	Stranded	Shearing	Sections
Monel Metal	Sta-Tru	Slitting	Segments
Nickel	Triple-Warp	Trimming	Spacers
Any special alloys available in rod or wire form	Twilled	Arc-Welding	Strips
	Twisted-Fill	Gas-Welding	Template Shapes
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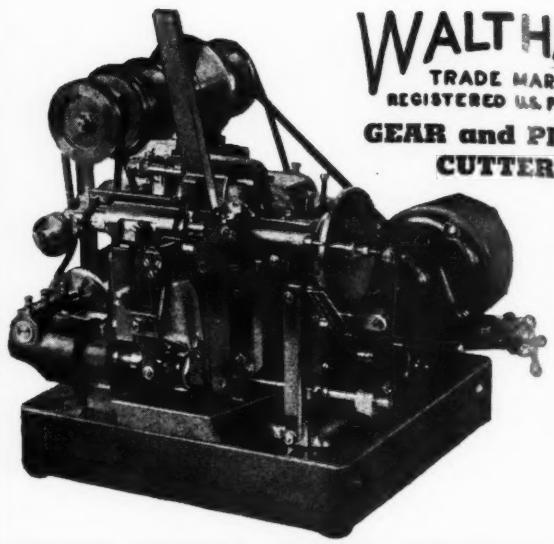
The LUDLOW-SAYLOR WIRE COMPANY
Newstead Avenue & Wabash Railroad
ST. LOUIS 10, MO.

Wire Cloth Baskets—Trays—Handling Fixtures—
for annealing, brazing, carburizing, cyaniding, dipping, hardening, heat-treating, handling, nitriding, pickling, plating, quenching, washing.



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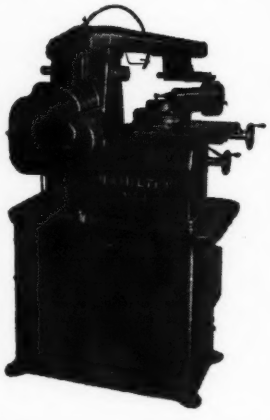
TRADE MARK
REGISTERED U.S. PAT. OFF.
GEAR and PINION CUTTERS

MAKE SMALL PART PRODUCTION ACCURATE AND ECONOMICAL

Use the new Waltham Gear and Pinion Cutter for high production and high accuracy on small diameter, fine pitch jobs. Individual motor drive through step cone pulleys permits a wide range of feeds and speeds. One-second loading and unloading feature eliminates lost motion. Write for full details of this and other Waltham Machines.

WALTHAM MACHINE WORKS
Newton Street, Waltham, Mass.
Makers of Small Thread Millers, Gear Cutters and other Small Automatic Machines



HAMILTON
SWISS TYPE
GEAR HOBBERS
for accuracy and speed in hobbing pinions, gears and sectors.

Two Models
No. 00 SPUR GEAR HOBBER for work up to 2" dia.
No. 1 SPUR and SPIRAL GEAR HOBBER (Illustrated) for work up to 6" dia.

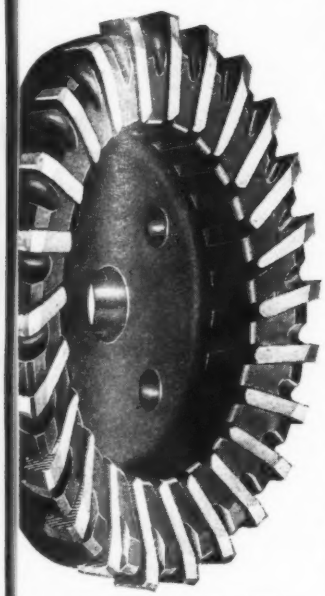
Write for further details to
Triplex Machine Tool Corp.
Sales Agents
125 Barclay St., New York 7, N. Y.
Manufactured by
THE HAMILTON TOOL CO.
Hamilton, Ohio

Consult
"NEWARK GEAR"
On Your Manufacturing Problems
Gear Cutting and Machines

Gear Specialists since 1904
NEWARK GEAR CUTTING MACHINE CO.
69 Prospect St., NEWARK 5, N. J.
FRANK E. EBERHARDT, President

You Get 65% Blade Usability

. . . WITH THIS OK "DUAL" ADJUSTMENT



ROUGHING CUTTER

TAPERED, serrated blades fit into mating slots in the cutter body. There they are immovably held without wedges, pins or set screws—yet may be quickly removed. As the slots are at an angle to the body, when the blades are set out one or more serrations, as required for regrinding, both radial and axial adjustments occur at the same time *automatically!* This not only saves time in moving the blades into line of wear, but actually results in 65% blade usability.

In this design, blades and cutter bodies are available for either roughing or finishing. In the roughing cutter (left), the blades are inserted radially into the body and shear into the work in the direction of feed. Major wear and adjustment are on the *periphery*, the face of the blade merely scraping the work just cut.

In the finish milling cutter (right), the blades are ground with a slight lead, to produce a *skiving* cut. Here the major blade wear and the major adjustment are on the *face*.

We shall be glad to send you full details of this Dual Adjustable principle if you will write us.

FINISHING CUTTER

INSERTED-BLADE METAL CUTTING

OK TOOL SYSTEM

MANUFACTURED ONLY BY THE O K TOOL COMPANY, SHELTON, CONN., U. S. A.

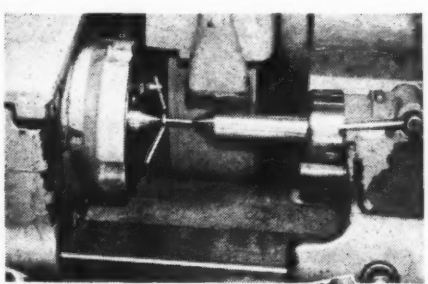
THE PEARSON . . PRECISION GRINDING DOG

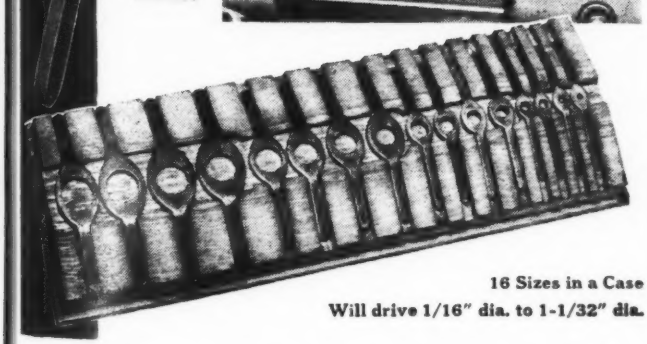
Always Ready • No Adjusting • Light • Balanced

Strong Hardened Steel

A wide wheel clearance as shown in use

Thinnest Dog on the Market





16 Sizes in a Case

Will drive 1/16" dia. to 1-1/32" dia.

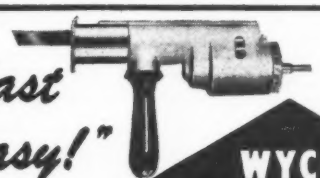
1/32" left over standard sizes to maintain a small amount of clearance for work. Dogs are 3/32" wide to 1/4" with very little space taken up for driving. Special dogs made to order with irregular holes.

Prices on Request Patent Protected

PEARSON-LUNDBERG MANUFACTURING CO.

WORCESTER, MASSACHUSETTS, U.S.A.

"It's Fast and Easy!"



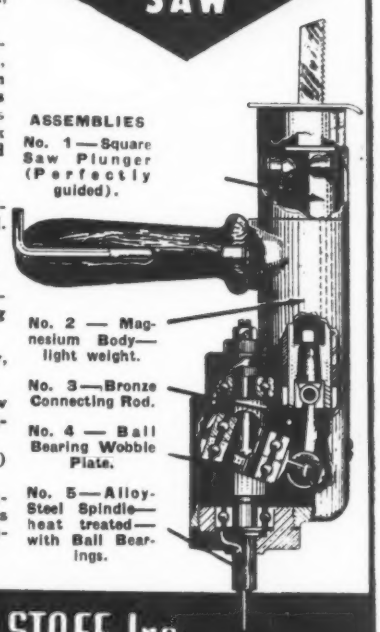
WYCO HY-SPEED SAW

Fits any 1/4" electric drill, air drill or flexible shaft.

Speedy! Accurate! Powerful! Saws and files metals, woods, plastics. Chucks in drill chuck or collet. Uses ordinary hack saw blades and standard 1/4" shank machine files. Easily used in difficult places.

- All rotating parts ball-bearing, running in oil.
- No gears. No cams. Always smooth-running.
- Square plunger with take-up for wear. All wearing parts heat treated.
- Saw chuck holds firmly, aligns saw perfectly.
- Complete with extra saw blade and 1/4" round machine file, $35.00. (Sold only thru jobbers)

Send for Catalog on Complete Line of WYCO Tools and Flexible Shaft Equipment.



ASSEMBLIES

No. 1—Square Saw Plunger (Perfectly guided).

No. 2 — Magnesium Body—light weight.

No. 3—Bronze Connecting Rod.

No. 4 — Ball Bearing Wobble Plate.

No. 5—Alloy-Steel Spindle—heat treated—with Ball Bearings.

WYZENBEEK & STAFF, Inc.

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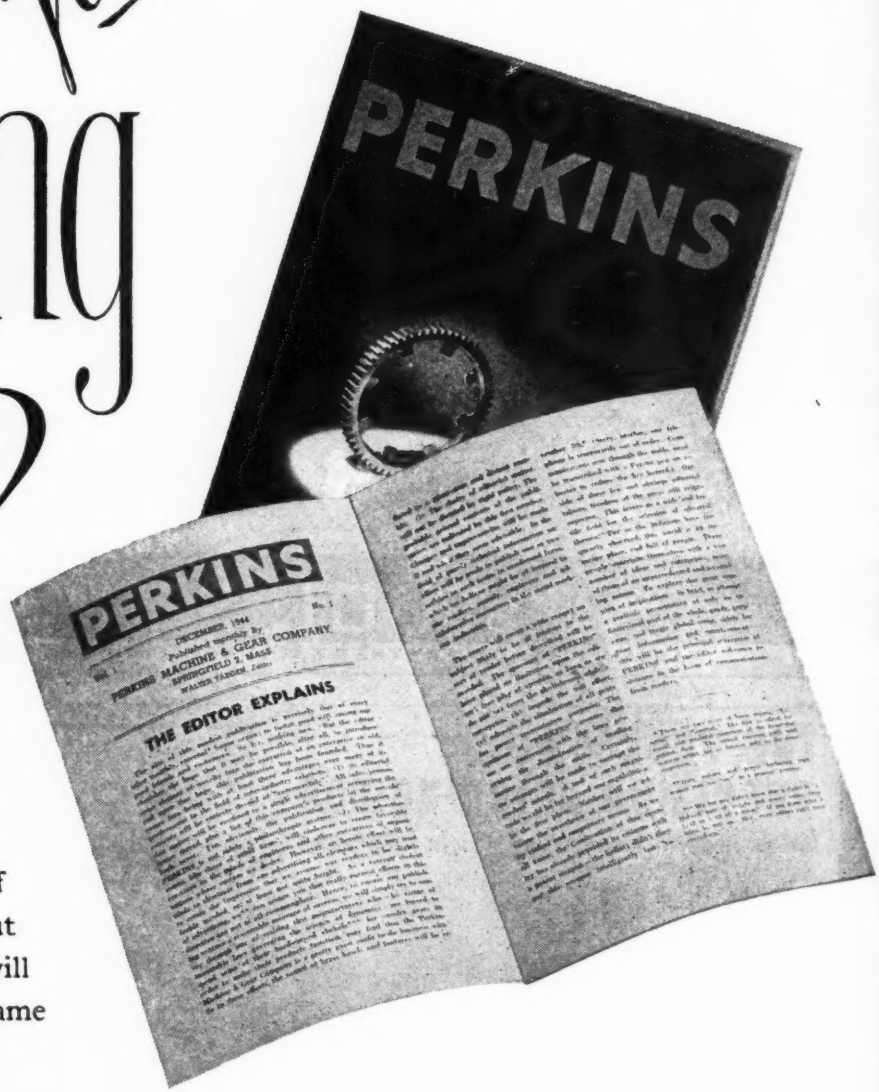
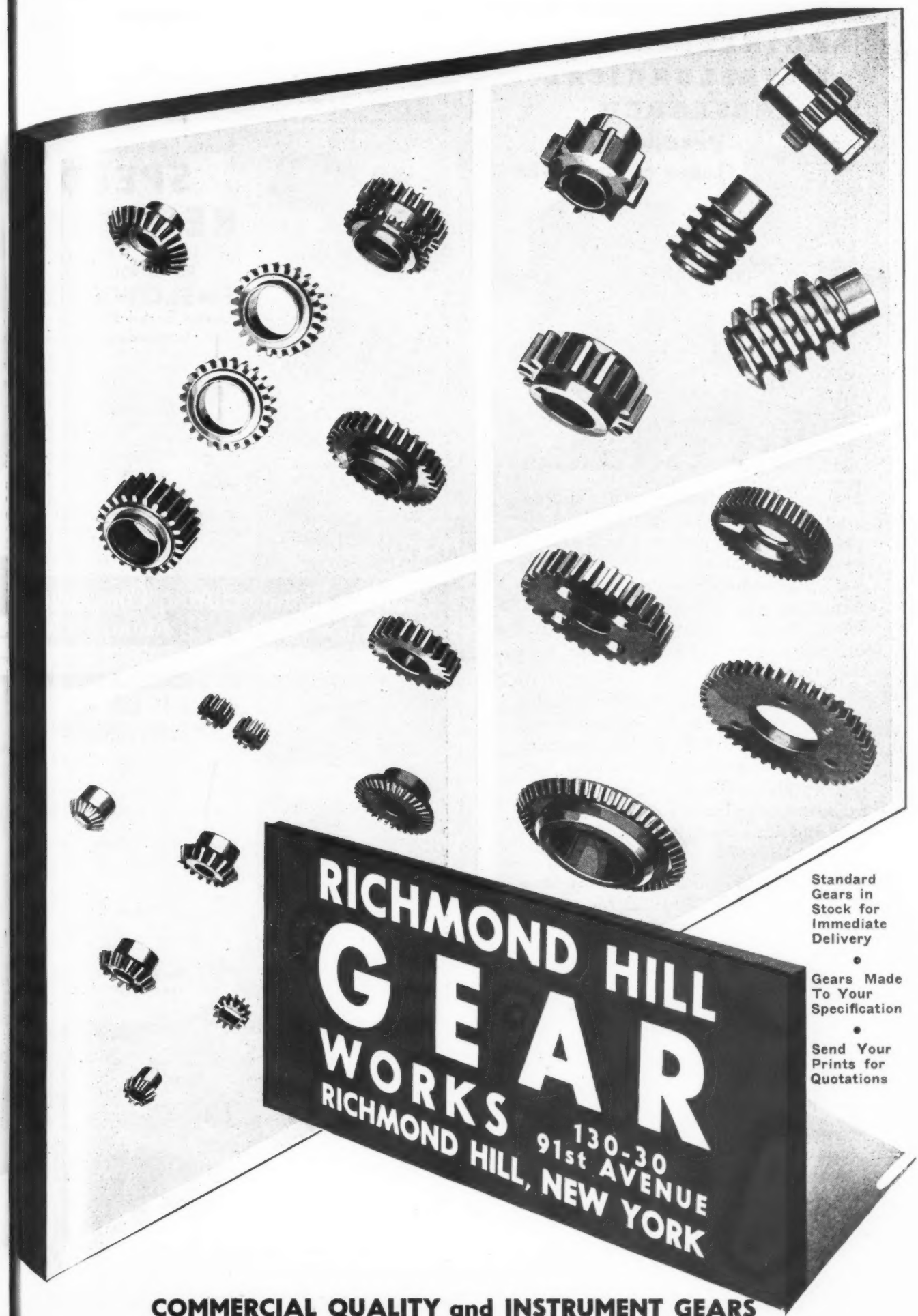


PERKINS is the name of the house organ we publish monthly. If you are a Purchasing Agent or Engineer of a firm which uses custom-cut gears in its products, we will be pleased to place your name on our mailing list.

The editorial content covers a wide range of interests and may be either amusing or instructive; at any rate, it is devoid of "commercials." Sales promotion matter is confined to a list of the company's products on the outside back cover, plus a single advertisement occupying the center spread. The purpose of these advertisements is to convey the idea that we not only know our business thoroughly, but that in general, we are a pretty good outfit to do business with. Please write us on your firm's letterhead if you wish to receive Perkins. Price of subscription: Your Good Will.

PERKINS MAKES: Helical Gears, Bevel Gears, Ratchets, Worm Gears, Spiral Gears, Spur Gears, Ground Thread Worms

PERKINS *custom-cut* **GEARS**
PERKINS MACHINE & GEAR COMPANY, SPRINGFIELD 2, MASS.



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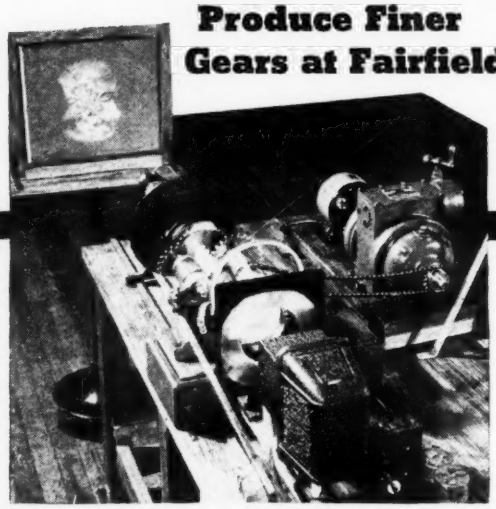
ENGINEERING AND METALLURGICAL RESEARCH

Produce Finer Gears at Fairfield

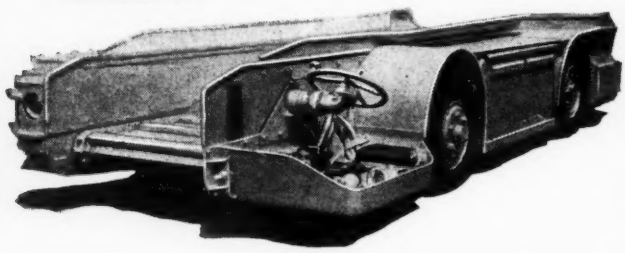


Metallurgical developments and engineering research at FAIRFIELD help produce finer gears. Photoelastic studies on plastic gear models provide a simpler, more accurate means of determining gear stresses. FAIRFIELD'S metallurgical laboratory maintains complete control of materials and heat treatment.

Wherever gears are highly stressed or where service conditions are severe, you'll find FAIRFIELD'S engineering and metallurgical developments paying big dividends in long life, freedom from service failures, production economy, and improved gear set efficiencies (see cut above).

Special gears on a production line basis. Write to FAIRFIELD for recommendations on your problems. No obligation, of course.

Fairfield equipped mine shuttle car.



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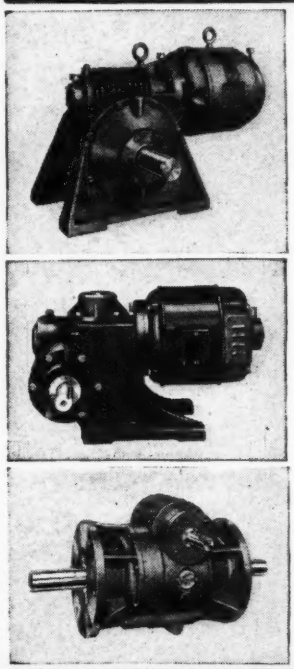
ARMY E NAVY

FAIRFIELD For FINE GEARS

Janette



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For SLOW SPEEDS

Janette Speed Reducers offer these outstanding advantages: No jackshafts, pulleys, belts, sprockets, or chains needed. The ratio of speed reduction is positive. Exceptionally low installation cost, because of their compactness. Motors, gears and gear boxes are all Janette built, eliminating divided reponsibility for their successful operation. A large number of styles are available to meet various kinds of applications. **Efficient, high speed, low cost motors can be used.** The construction permits easy access to all parts, resulting in low cost maintenance. **Catalog Upon Request.**

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Diefendorf made gears throughout the war—gears for planes, ships—gears for machinery—just gears.

Now all the Know How gained in war is being used in making better gears for the requirements of Peace Time.

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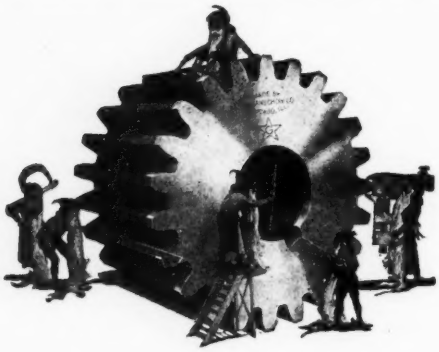

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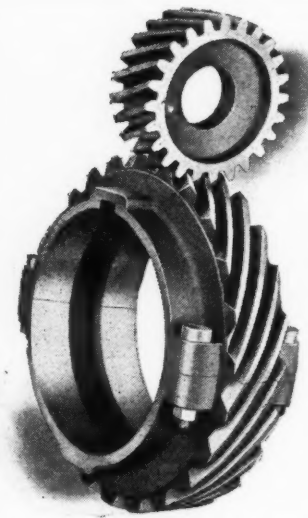

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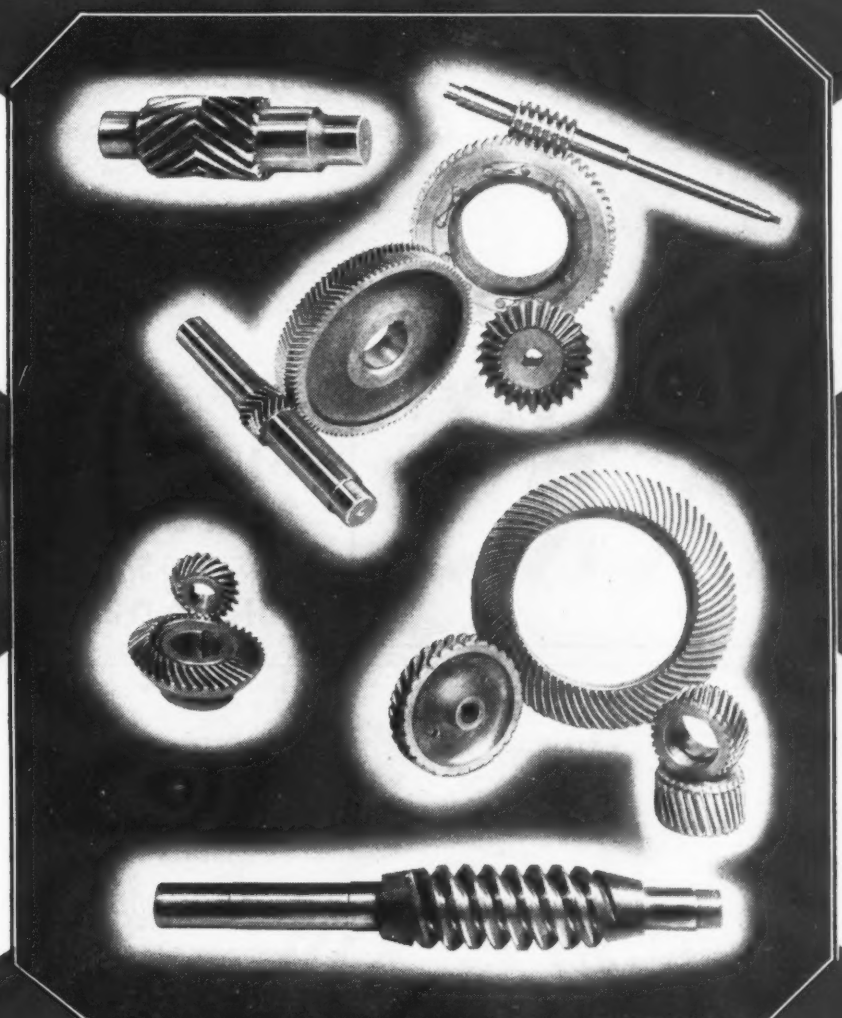

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Years ago, our founder coined a slogan: "*Gears we can't make, ain't*" . . . ungrammatical, but so very true.

Literally, during our long and specialized experience, it is questionable if there is any type of gear (or geared transmission device) that we have not made, . . . and, that is the reason why we have been labelled by so many industrial firms as "*Gear Headquarters.*"

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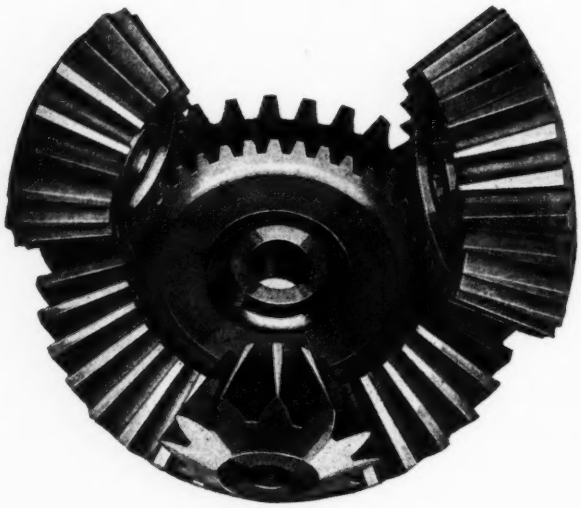

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Get your Gears from Bilgram – it's the one place which delivers the dependability you need, the accuracy and speed so necessary for today's pace!

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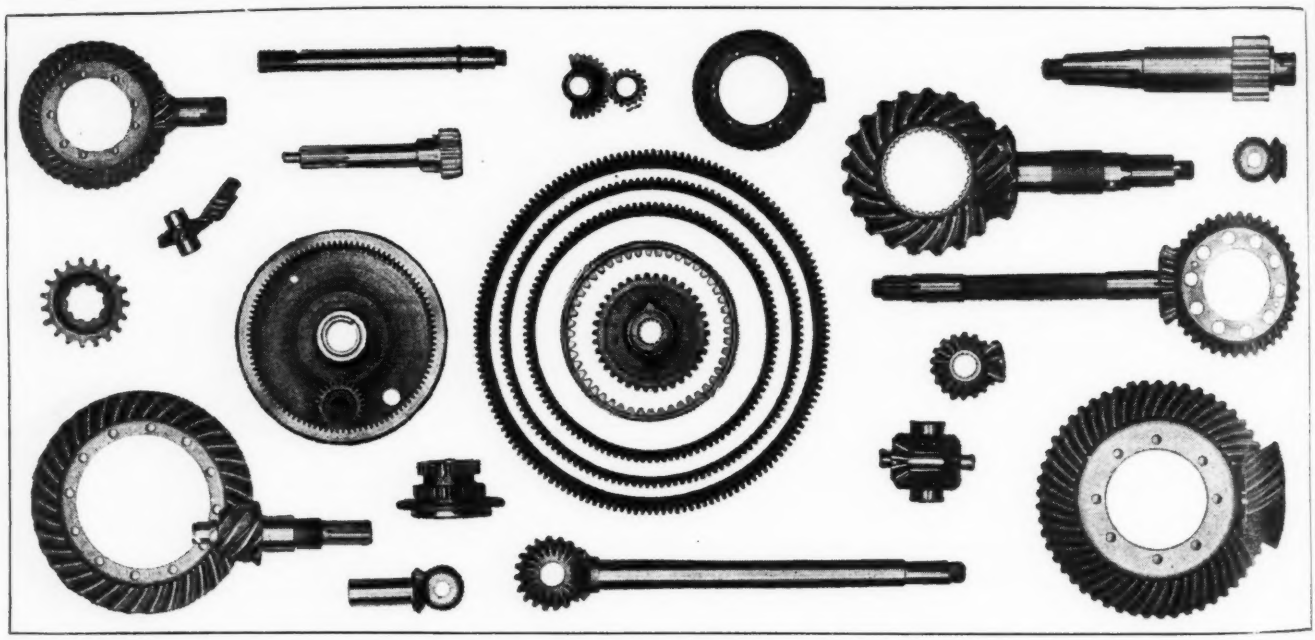

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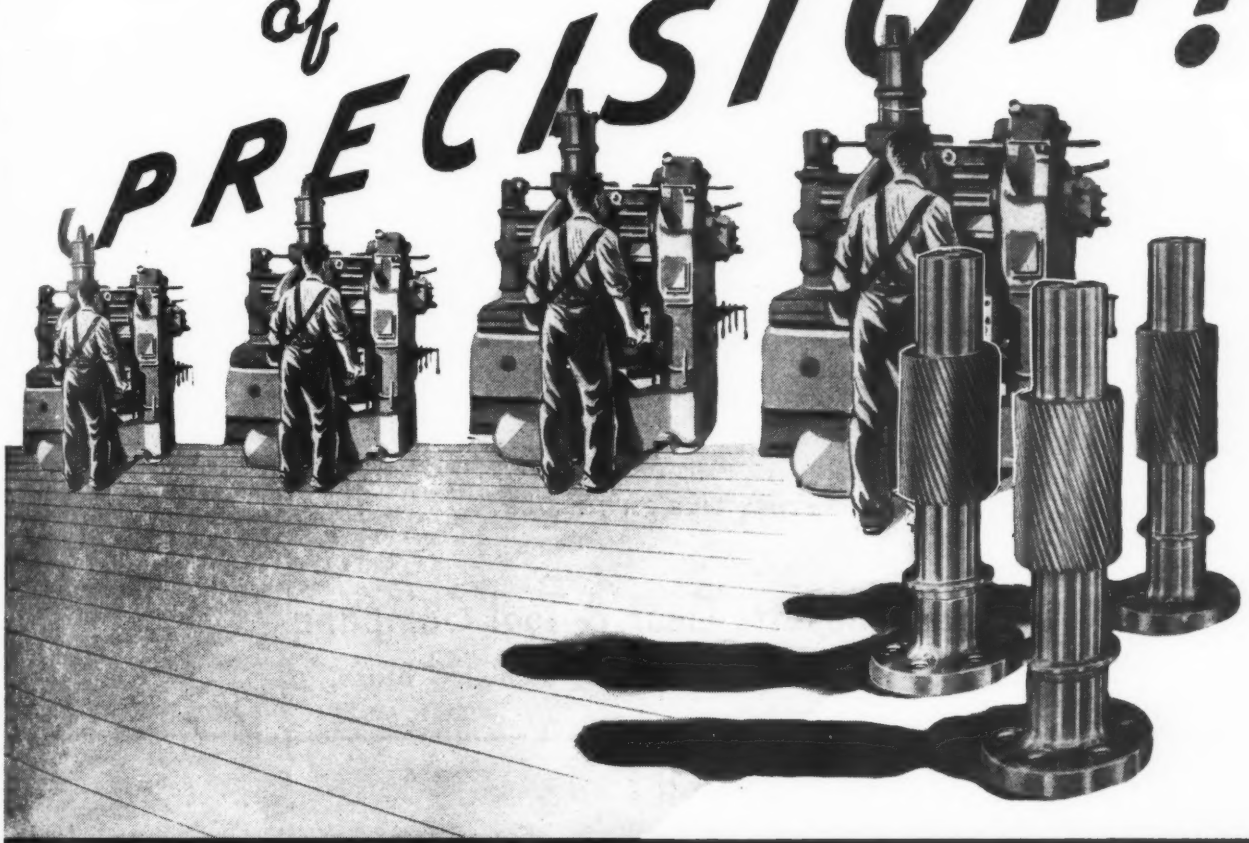

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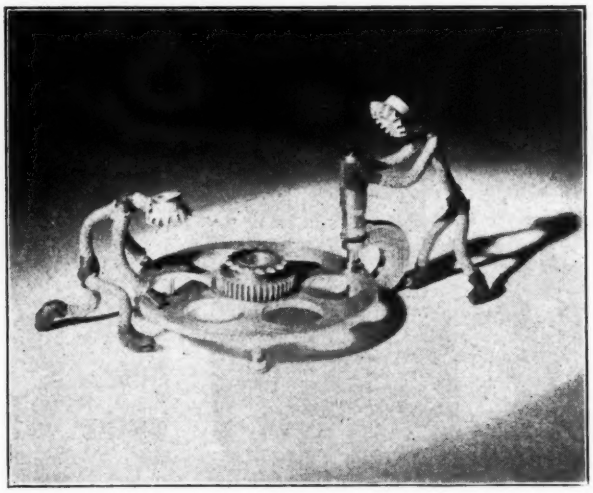
GEAR TOLERANCES MORE THAN EVER BEFORE ARE TOWARD HIGHER STANDARDS



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Mass Gears HAVE MAINTAINED AND WILL CONTINUE IN THIS ENDEAVOR

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The traditional dependability of Cincinnati Gears, Good Gears Only, under the toughest of operating conditions is being emphasized as never before.

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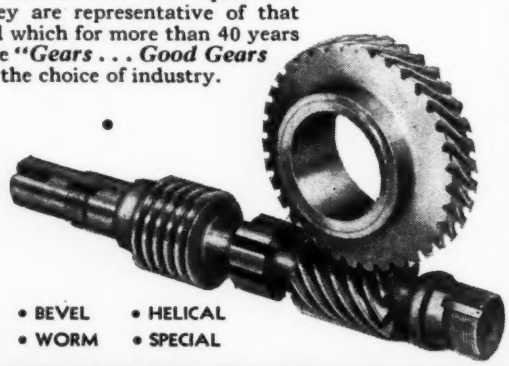

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"Gears . . . Good Gears Only"
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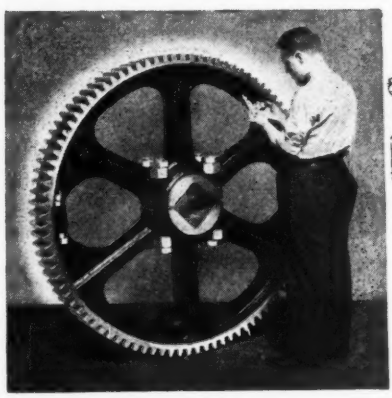

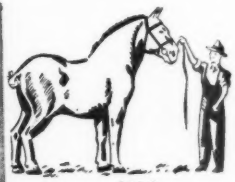

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"Well built" aptly describes Stahl Gears, for they are skillfully designed and correctly proportioned for maximum efficiency in power transmission. And our vernier testing equipment reveals that Stahl Gears really are "well built"—down to the last decimal point in every dimension.

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differential variable speed transmissions

smooth, shockless acceleration from absolute zero to any desired speed

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Capacities range from 1 HP to approximately 20 HP.

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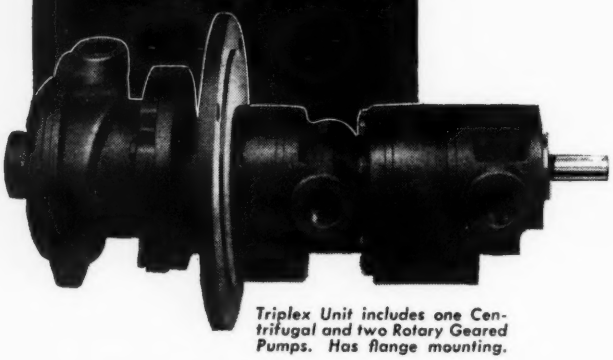

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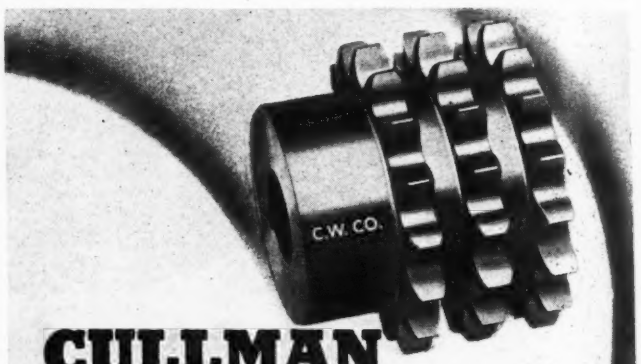
BROWN & SHARPE PUMPS



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Specialized equipment and long experience are your assurance that exacting demands will be met, and the most economical methods of production will be used on the Cullman Sprockets made for you.

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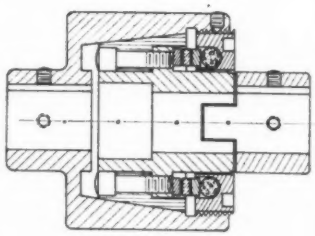

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Correct for misalignment, absorb shock, vibration, whip, chatter. Protect machines.

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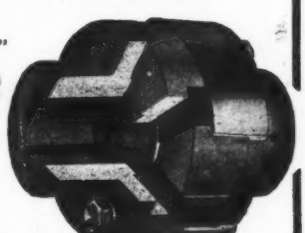

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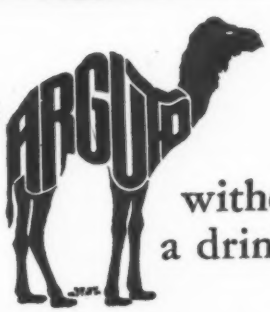

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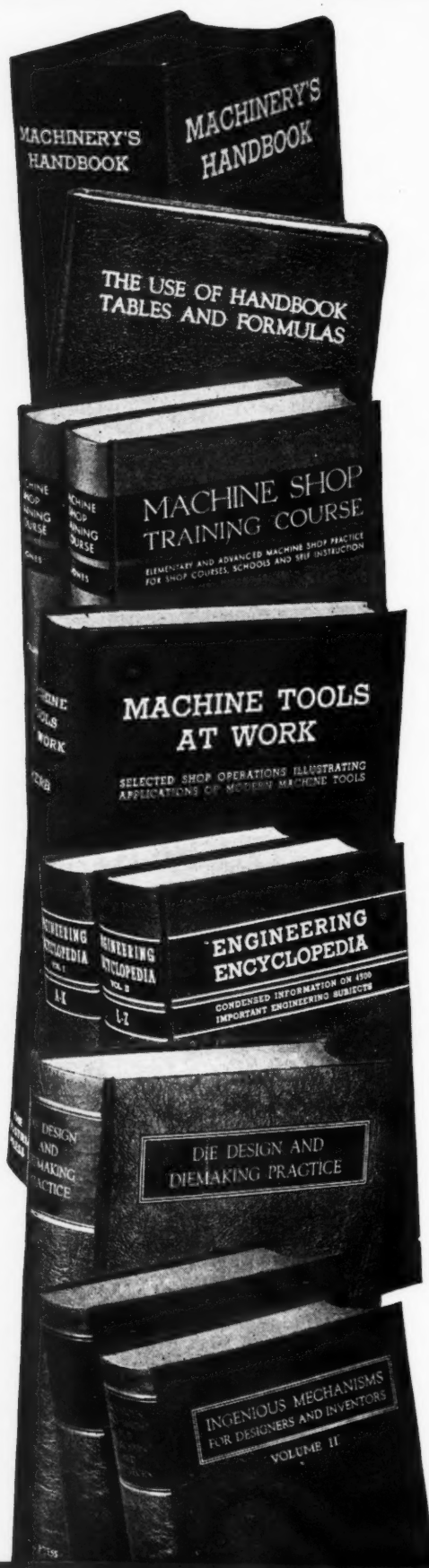
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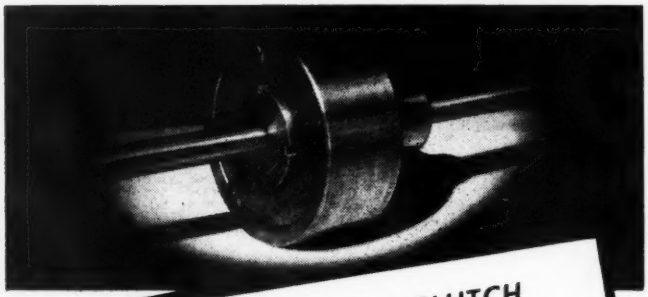

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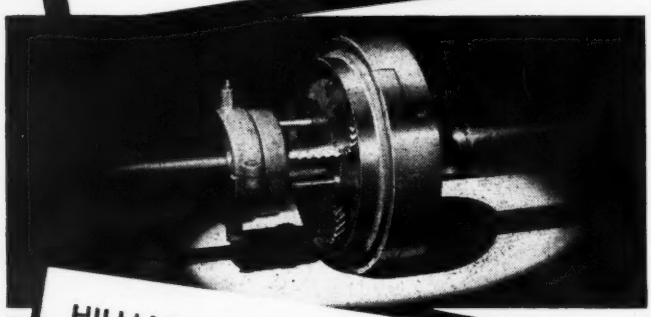

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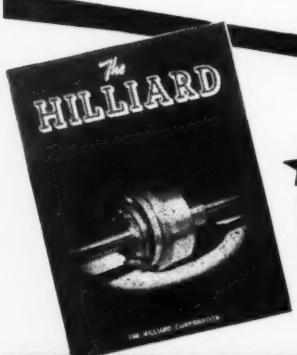

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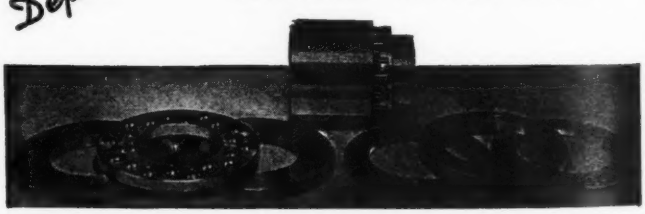

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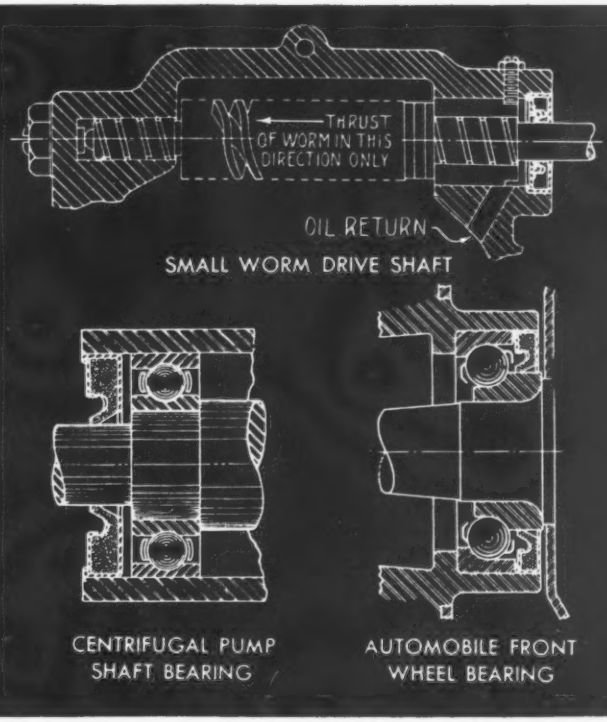
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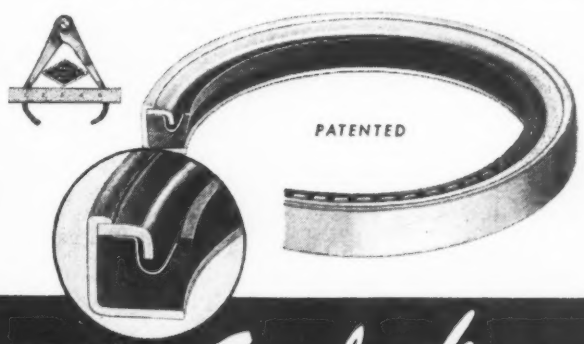

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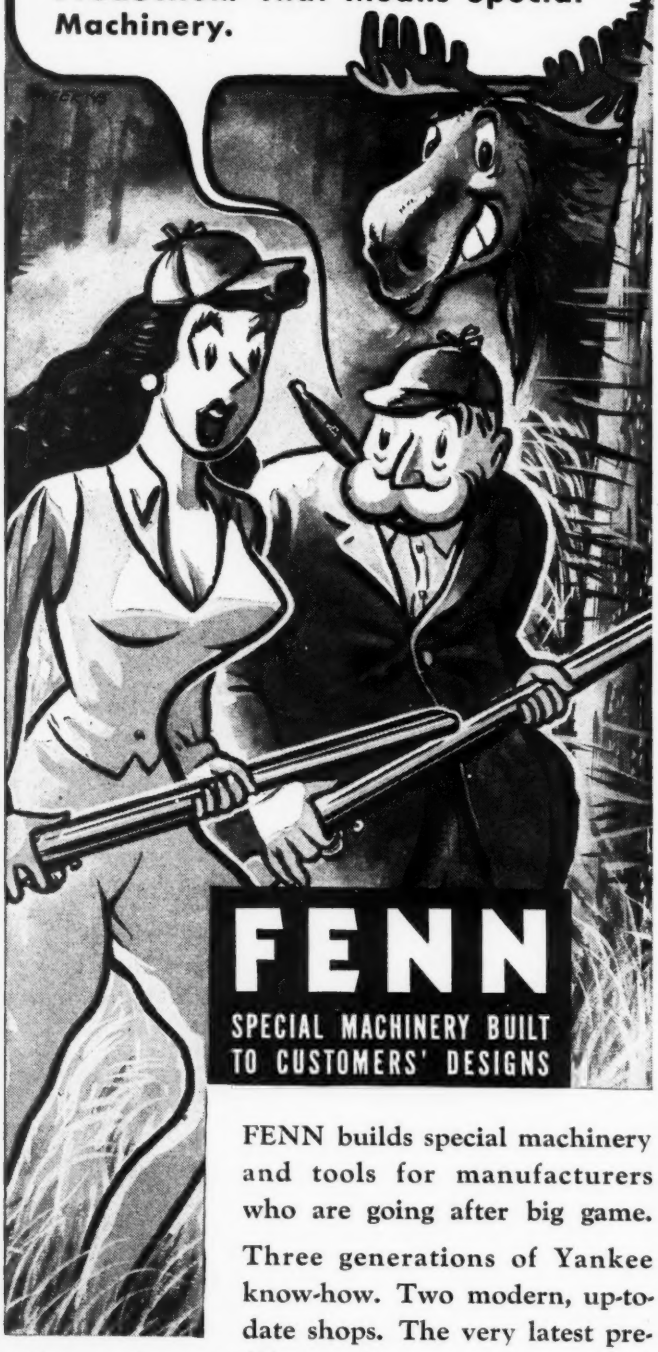

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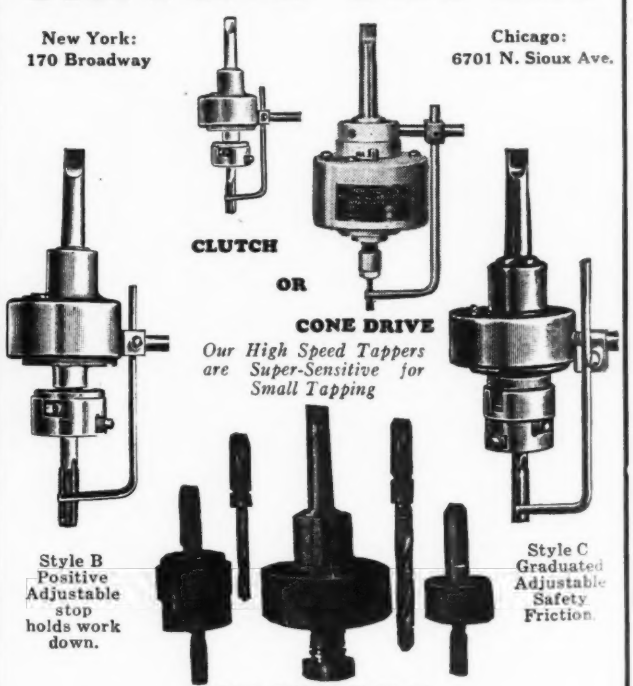

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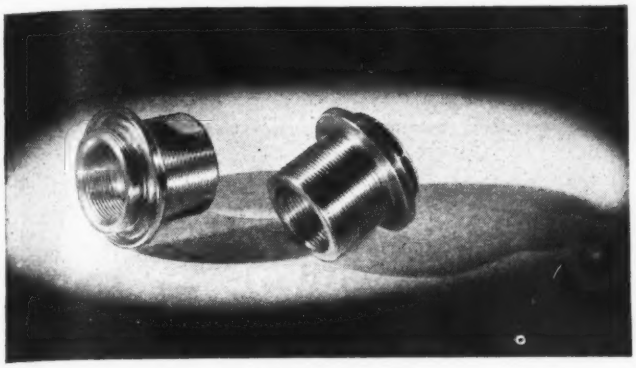

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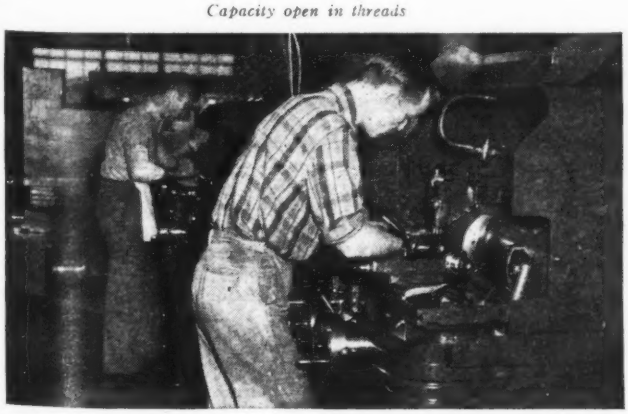

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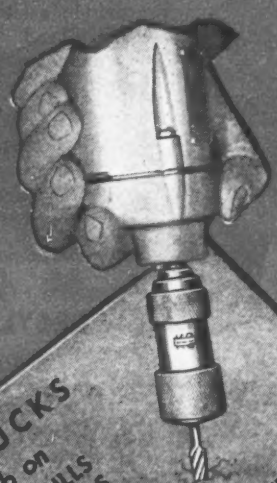

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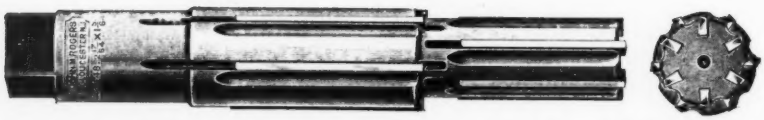

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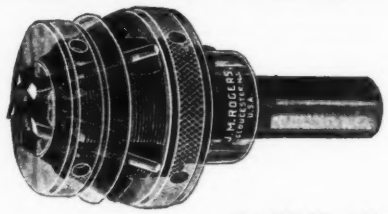

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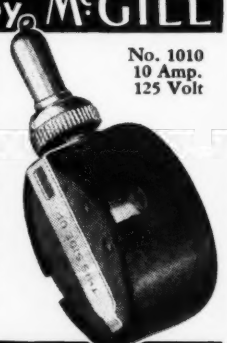

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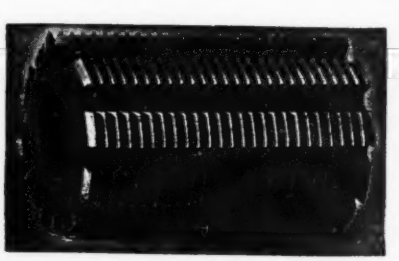

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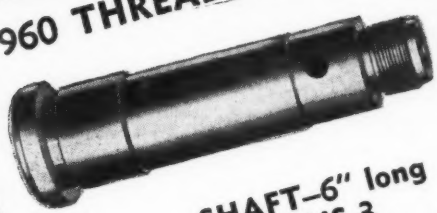

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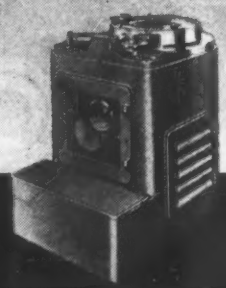

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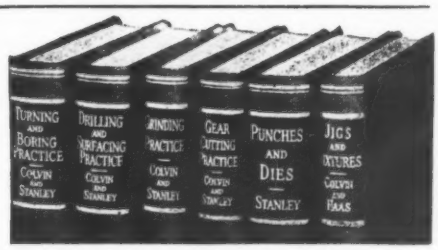

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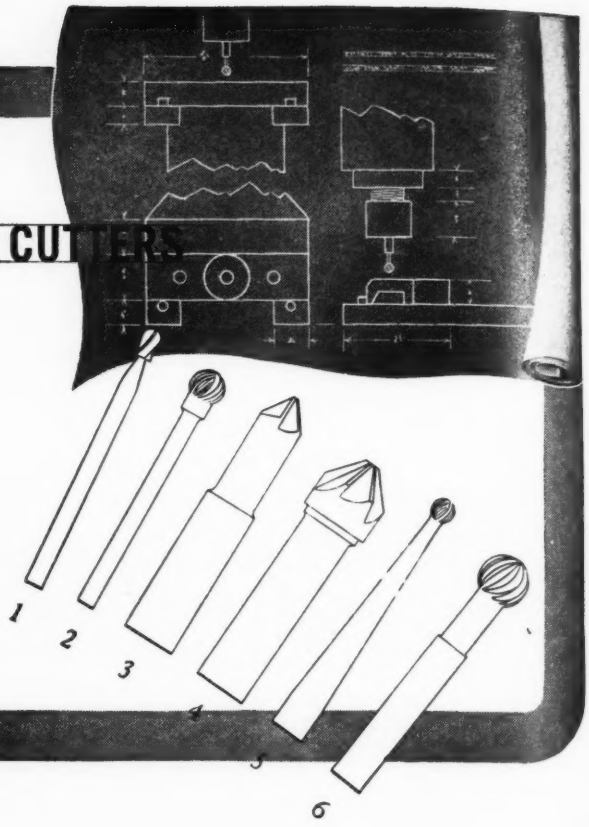

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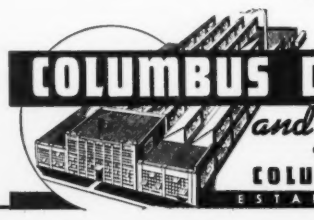

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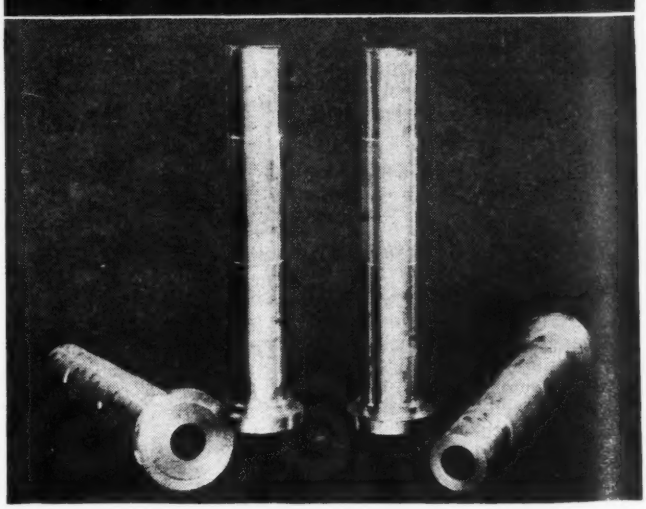

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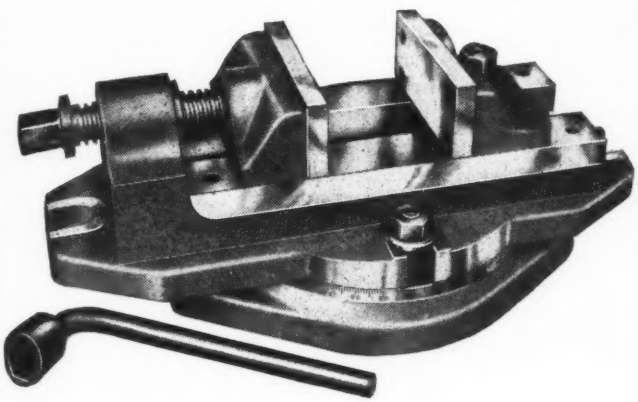

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for holding shafts or spindles.

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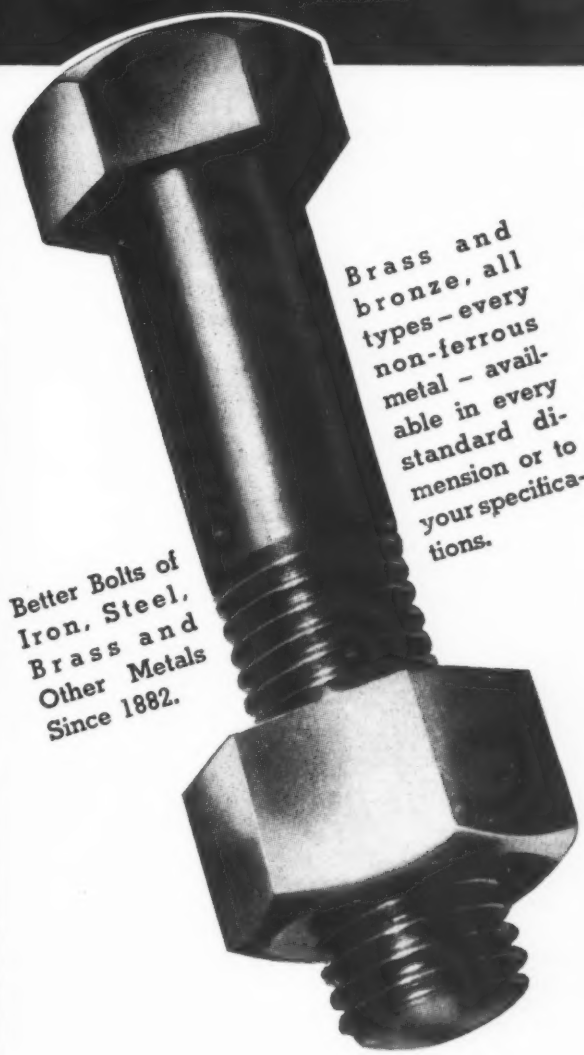

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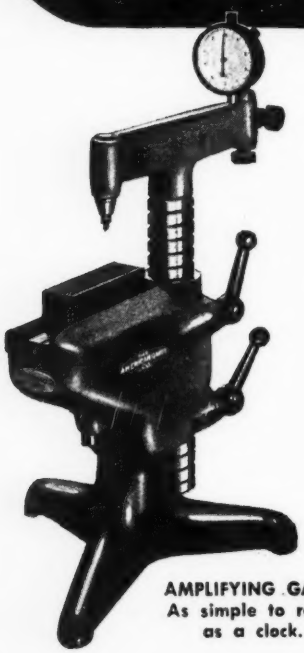

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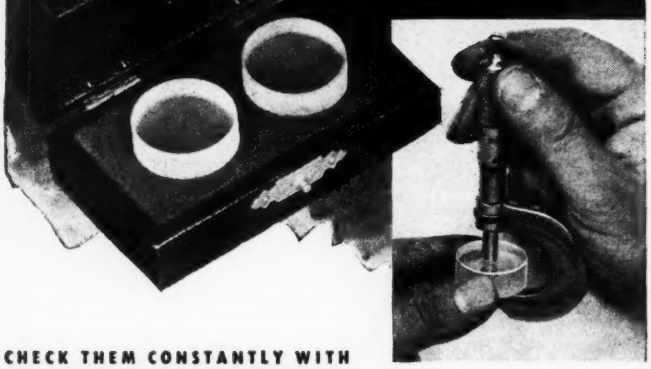

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When spindle end or anvil surface of a micrometer wear out of parallelism, the mike's accuracy is affected. An occasional check with Scherr Micrometer Parallels will tell you when the micrometer measuring surfaces begin to need refinishing.

The two flats differ in thickness one half turn of the micrometer spindle. Close the spindle on one of the flats and observe the light rays at points of contact. Then measure the other flat in the same way. If the interference bands appear the same, no correction is needed. If they differ in appearance, parallelism has been lost.

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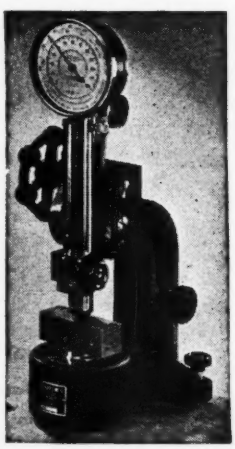

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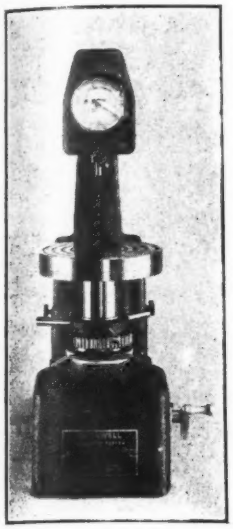
HARDNESS TESTER

TUKON TESTER
for
KNOOP HARDNESS NUMBERS



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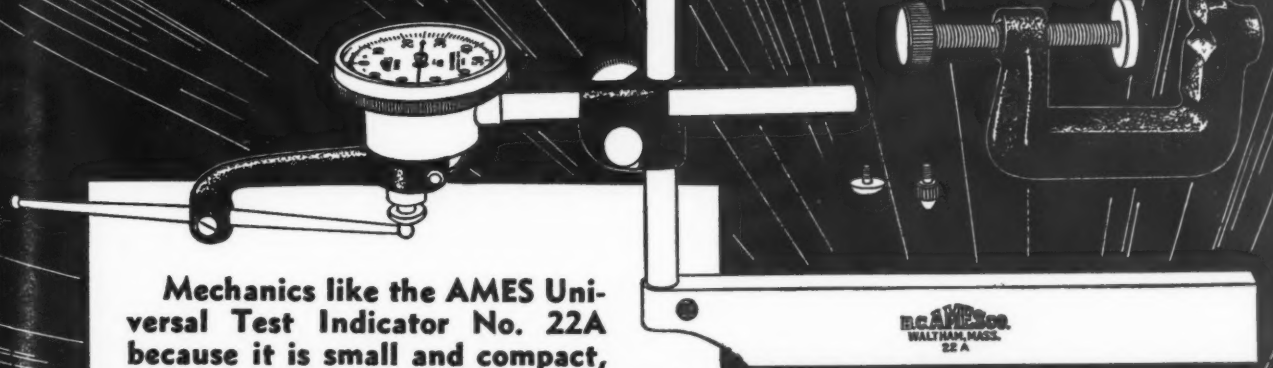

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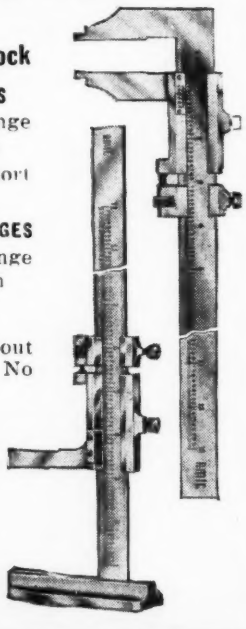

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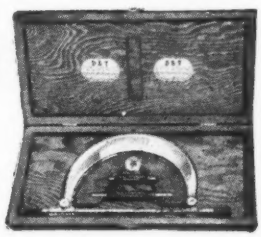

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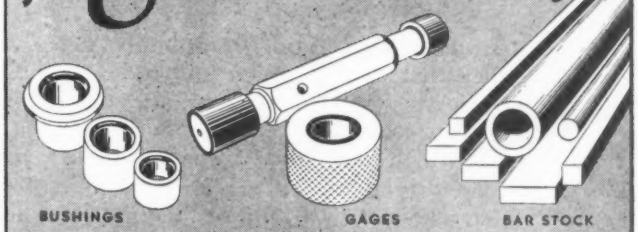

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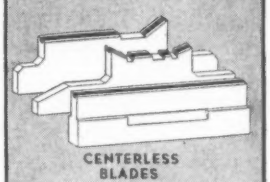

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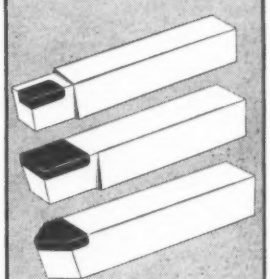

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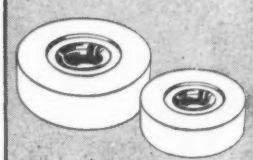
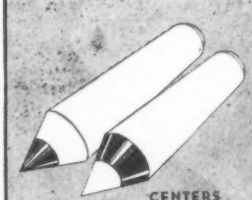


DRAWING DIES



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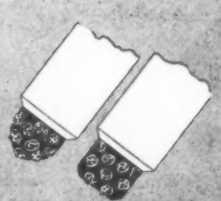

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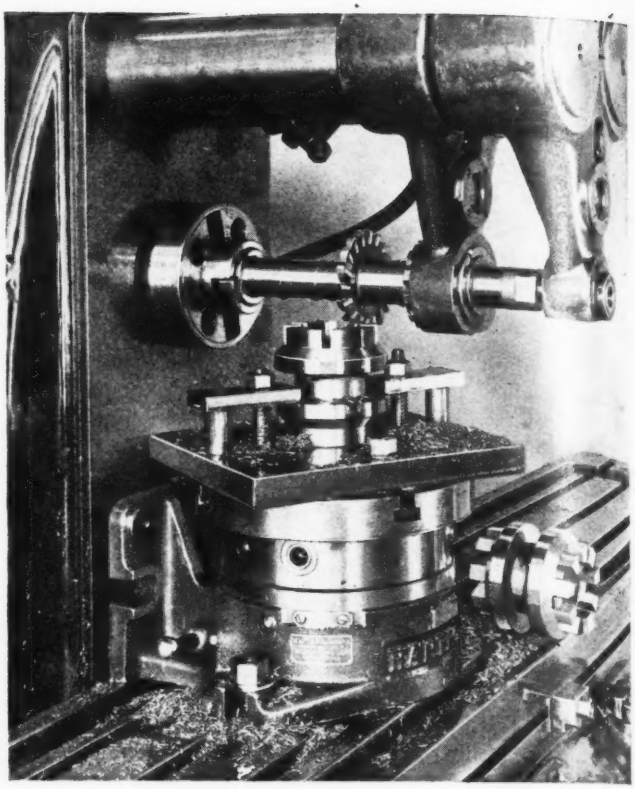

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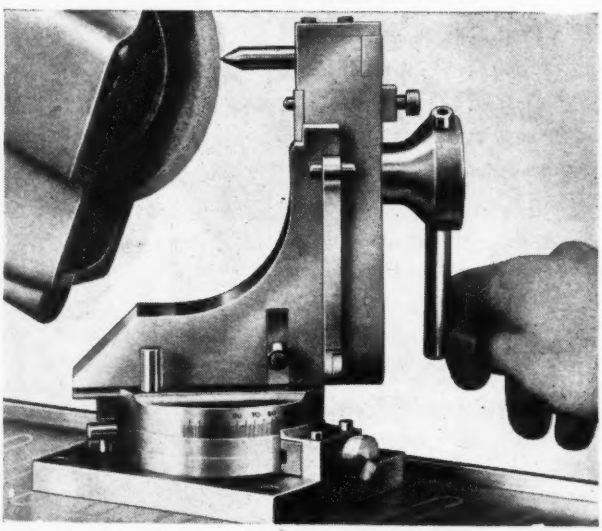

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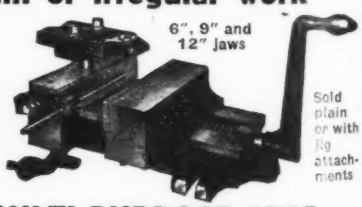
With insertable jaws for all sorts of irregular shapes, plus stops, guides, drill bushings, etc., this vise is a many-purpose jig and fixture for drill press, miller, planer, shaper, etc. Sizes from 124 lbs.



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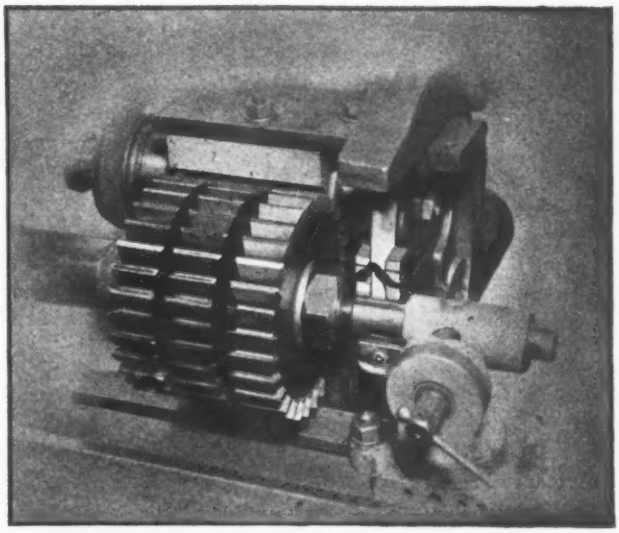

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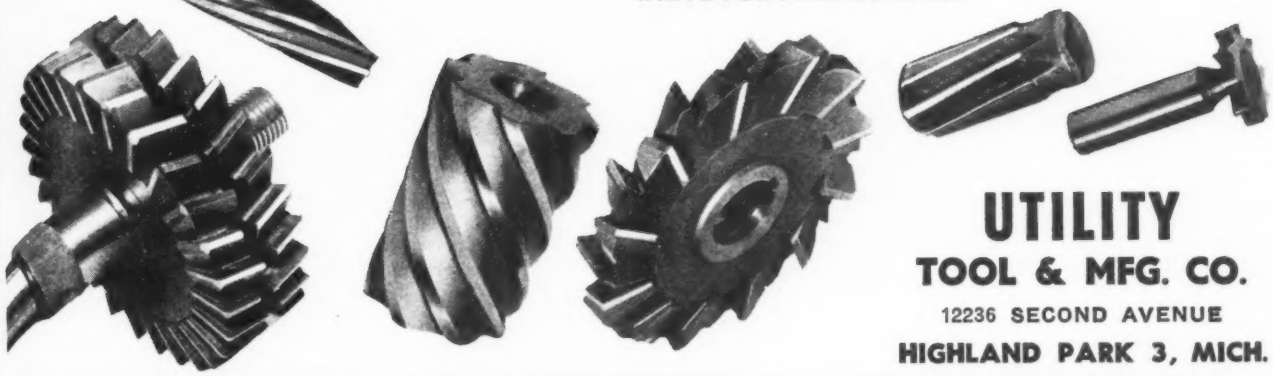

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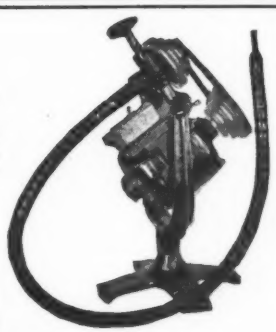

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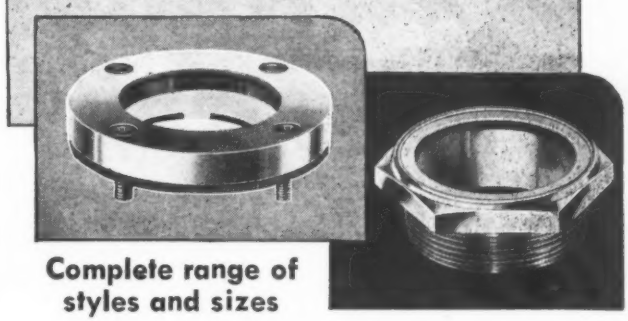

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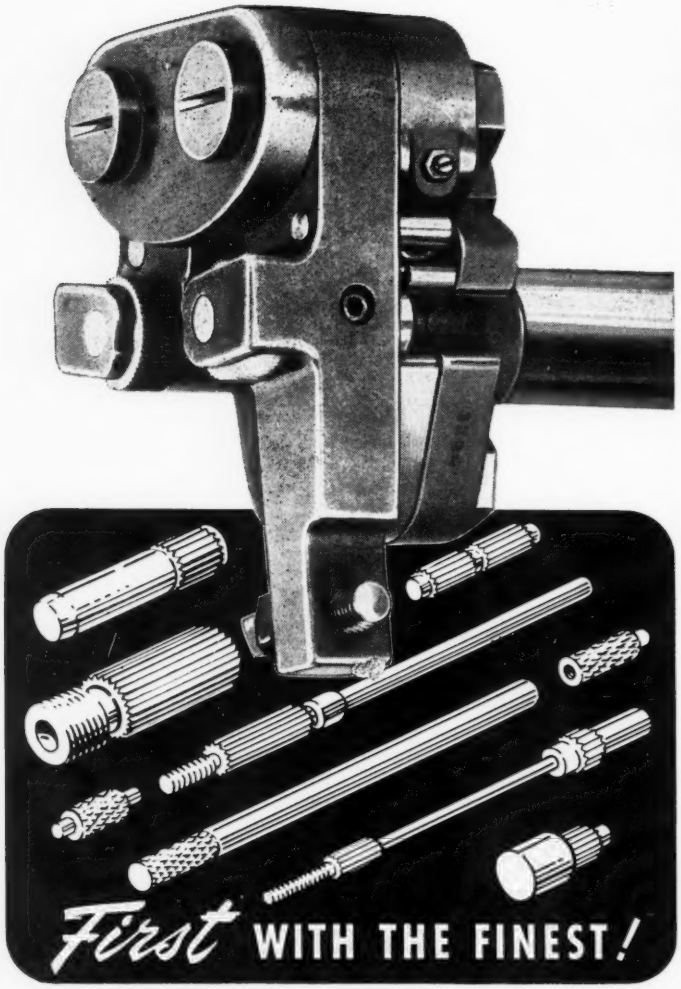

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FOR TURRET TYPE SCREW MACHINES

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Built on a new principle, operated from the turret, with feed and pressure equally applied simultaneously to both sides of work. Speedy in operation, giving clean, accurate knurling in a minimum of time.

Sturdily built with the usual Boyar-Schultz quality of precision manufacture.

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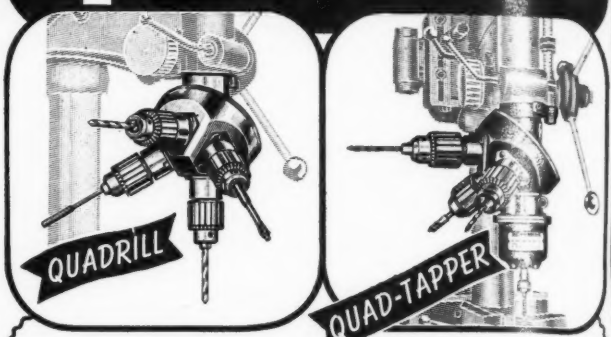

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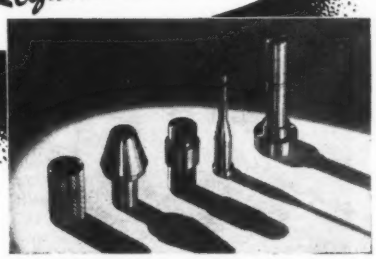

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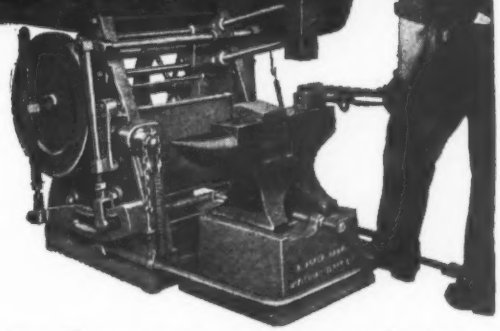

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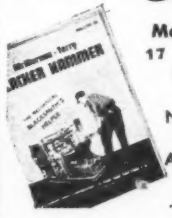

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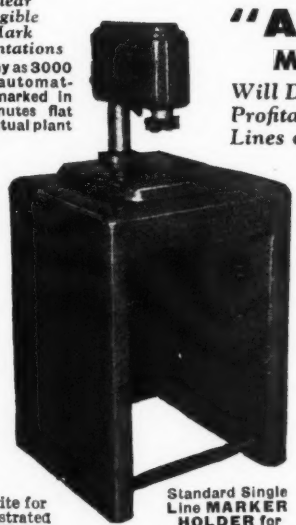

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102

EASTERN REBUILT MACHINE TOOLS

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10"x20" Pratt & Whitney Bench, m.d., latest.
12"x8' Lodge & Shipley Selec. Head, m.d. in base.
14"x6' Pratt & Whitney, cone.
14"x6' American Geared Head, taper, collets, m.d.
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18"x7' Chard, cone, motorized.
18"x8' Lodge & Shipley, cone, motorized.
18"x8' Rockford, cone.
18"x8' Lodge & Shipley, cone, with turret.
18"x102" Centers Lodge & Shipley Selec. Head, m.d. in base, taper, chip pan, latest type.
18"x106" Centers Lodge & Shipley Selec. Head, m.d. in base, taper, chip pan, latest type.
18"x120" Centers Monarch Geared Head, m.d. in base, taper, oil pan, flame hardened bed, latest type.
18"x18' Lodge & Shipley Selec. Head, m.d., taper.
20"x13' Springfield Geared Head, m.d., taper.
22"x16' Centers (22' bed) American 100 H.P. Input Super Lathe, with 100 H.P. D.C. motor, p.r.t., chip breaker, chip conveyor.
24"x7' Centers LeBlond, m.d
24"x72" Centers Lodge & Shipley Selec. Head, m.d., latest type.
24"x14' American Geared Head, m.d., taper.
24"x16' American Geared Head, m.d.
24"x16' New Haven, cone.
24"x30' Schumacher-Boye, cone.
24"x16' Niles-Bement-Pond, cone.
26"x12' Schumacher-Boye, cone.
27"x16' LeBlond, cone, taper.
30"x12'6" Niles-Bement-Pond, m.d., taper.
30"x13'6" Niles-Bement-Pond, m.d.
30"x26' Lodge & Shipley Selective Head, m.d.
30"x28' bed (20' centers) Niles "Time Saver" Geared Head, latest type.
36"x10' Putnam, motorized.
36"x12' Wright, cone.
36"x14' Boye & Emmes, cone, motorized.
36"x20' American Geared Head, m.d.
36"x28'6" bed (20' centers) Niles Heavy Duty, m.d., taper, latest.
36"x28'6" Niles, as above, no taper.
36"x36'6" (28' centers) Niles Heavy Duty, m.d., latest type.
42"x26' American Geared Head, m.d.

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No. 2 Morton, belt.
30" stroke Morton, m.d.

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No. 2K Milwaukee, m.d. in base, latest.
No. 3B Brown & Sharpe, m.d.
No. 3B Milwaukee Double Overarm, m.d.
No. 4B Brown & Sharpe Double Overarm, dial type, m.d. in base.
No. 4 Cincinnati Medium Speed Dial Type, m.d., latest.
No. 4 Cincinnati High Power, m.d.
No. 4 Heavy Milwaukee, m.d. in base, dial feed.
No. 4K Milwaukee, m.d. in base, latest type.
No. 5B Heavy Brown & Sharpe Plain, m.d.
Morton Horizontal Milling, 66" stroke.

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No. 2A Brown & Sharpe, m.d., taper spindle.
No. 2L Cincinnati, m.d. in base, latest.
No. 3A Brown & Sharpe, m.d., taper spindle.
No. 4A Brown & Sharpe, m.d., taper spindle.
No. 4 Cincinnati H.P., m.d., flanged spindle.
No. 4B Milwaukee, m.d.

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No. 1 Beaman & Smith Comb. Vertical and Horizontal.
No. 2 Cincinnati, m.d., flanged spindle.
No. 2 Brown & Sharpe, s.p.d.
No. 3 Cincinnati, m.d., flanged spindle.
No. 3B Milwaukee, m.d. in base.
No. 3B Milwaukee, m.d.
No. 3 Cincinnati Medium Speed Dial Type, m.d. in base, latest.
No. 3V Toledo, s.p.d.
No. 4 Cincinnnati, m.d., flanged spindle.
No. 4 Cincinnati H.P., m.d., National Standard Spindle, latest type.
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No. 5 Jackson, m.d.
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No. 4—36 Cincinnati Hydromatic
No. 3 Sundstrand Rigidmil
No. 5 Plan-O-Mill Thread
Nos. 1 & 2 Kent Owens hand

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12"x36" Grand Rapids hydr. surface
6"x18" Thompson hydr. surface
16", No. 10 Blanchard rotary surf.
16" Arter rotary surface
No. 72A3 Heald Sizematic internal
No. 2 Cincinnati, centerless

BROACHES

No. 1 Foote Burt vert. surf., hydr.
No. 25 Lapointe hydraulic
Twin Ten Oilgear hydraulic
No. 2XA12 Oilgear twin hydr.
No. 4 Oilgear hydraulic

LATHES

2½", No. 7A Jones & Lamson turret
4½", No. 3B Foster turret
14"x18" Monarch Magnamatic
15"x22½" Sundstrand auto stub.
8"x12" Sundstrand stub.
17"x6' Leblond grd. hd. Mfg.

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Nos. 16HS & 18H G. & E. hobbers
No. 12 Barber Colman hobbers
Nos. 1 & 5A Lees Bradner hobbers
11" & 15" Gleason bevel generators
18" Gleason testers & lappers
8" Red Ring lapper
No. 3 Barber Colman hob grinder

MISCELLANEOUS

Automatic. No. 454 New Britain
Buffer. 5HP, Model 40 Standard (New)
Drill. 24", No. 25 Foote Burt (3" capacity)
Drill. 4' American Trip. Purp. radial
Drill. 21" & 24" Cincinnati upright
Compressor. 1400 cu. ft. Sullivan
Mills, Boring. 2½", 3½" & 4½" bar Universal
Planer. 36"x36"x10' Hamilton
Shaper. 15" Potter & Johnston toolroom
Shaper. 32" Morton draw cut
Slotter. 4" Stevens die
Slotter. 12" Betts
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42" BULLARD New Era Vertical with one swiveling turret head and one side head. AC or DC motor drive.

NO. 1 PUTNAM Vertical Car Wheel Boring Mill with side head for hub facing and hoist. AC or DC motor dr.

48" NILES-BEMENT-POND Car wheel Boring Mill with hoist. AC or DC.

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120" BETTS Heavy Vertical with two swiveling heads, Power Rapid Traverse, AC or DC motor drive.

120" NILES-BEMENT-POND Vertical with two swiveling heads, Power Rapid Traverse. AC or DC motor drive.

120" CINCINNATI Massive Pattern Vertical with two swiveling heads, Power Rapid Traverse. AC or DC.

10'-16' CINCINNATI Extension Type Vertical with two swiveling heads, Power Rapid Traverse. AC or DC.

No. 32. 3¾" Bar LUCAS Horizontal Table Type Boring, Drilling, and Milling Machine, Power Rapid Traverse, AC or DC motor drive.

4½" Bar NILES - BEMENT - POND Horizontal Table Type Boring, Drilling and Milling Machine, Duplex Control, AC or DC drive.

5½" Bar NILES - BEMENT - POND Heavy floor Type Horizontal Boring, Drilling, Milling Machine. AC or DC.

RADIAL DRILLS

4' HAMMOND High Speed Sensitive Drill, lever feed with tapping attachment, AC or DC motor drive.

5½' AMERICAN Full Universal Triple Geared with tapping attachment. Single pulley belt drive or AC or DC.

8' CARLTON Plain 15" round column DC motor on arm, tapping attach.

8' NILES - BEMENT - POND "Right Line" Plain with 230 volt DC motor on arm, tapping attachment.

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12" O. S. WALKER Single Stroke Surface Grinder with 12" dia. magnetic chuck and 7½ HP, AC or DC motor.

No. 16 BLANCHARD High Power Vertical Surface Grinder with 26" magnetic chuck and 20 HP, AC or DC.

No. 1 BESLEY Disc Grinder with two 12" steel discs and two plain tables, belt drive through countershaft.

LATHES

27"x12' AMERICAN 8 speed geared head, 96" between centers. AC or DC.

42"x36' PUTNAM Geared Head, 25' between centers. Quick change gear box. AC or DC motor drive.

48"x30' BRIDGEFORD 9 speed geared head, 20' between centers. Triple geared internal face plate drive. AC or DC motor.

48"x20' NILES-BEMENT-POND Extra Heavy Geared Head, 11'5" between centers. Power cross and angular feed to compound rest. Semi-quick change gear, taper attachment.

48"x59' BRIDGEFORD Boring and Turning with 9 speed geared headstock, turning carriage with compound rest, AC or DC motor drive.

NO. 4 PUTNAM Extra Heavy Center Drive Axle Turning Lathe with two carriages AC or DC motor drive.

27" Swing 98" Centers BRIDGEFORD Plain Turning Lathe for car axles or heavy forgings, two carriages and tool rests. Single pulley belt drive or AC or DC motor drive.

42" PUTNAM Heavy Double End Car wheel lathe. Equipped with overhead hoist for loading wheels and axles.

72"x77' (65'—6" center) NILES-BEMENT-POND heavy geared head lathe, two carriages with compound rests, power cross and angular feed. Power rapid traverse, taper attach.

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No. 2 CLEVELAND Plain, table 13"x15" B & S taper No. 11. Single pulley belt drive or AC or DC motor.

NO. 3B BROWN & SHARPE Plain with double overarm table 14"x60" with 7½HP, AC or DC motor.

NO. 4 CINCINNATI High Power Plain, Power rapid traverse, table 16½"x64". Single pulley belt drive or AC or DC.

NO. 5B BROWN & SHARPE Plain, Power rapid traverse, table 22"x81". AC or DC motor drive.

No. 3 CINCINNATI High Power Vertical, Power rapid traverse, table 59" x 13", Single pulley belt drive or motor drive.

No. 1½ KNIGHT Vertical Milling and Drilling with power longitudinal feed to tilting table. Table 7½"x29", AC or DC motor drive.

NO. 4 CINCINNATI High Power Veritcal, Power rapid traverse. Table 16½"x64". Single pulley belt drive.

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30"x30"x10' NEWTON Horizontal Spindle Slab Miller with adjustable rail, table 27"x11'. AC or DC motor drive.

24"x36"x12' INGERSOLL Planer Type side milling machine with two power feed heads on housings for side milling only.

24"x24"x12' INGERSOLL Planer Type milling machine with one head on adjustable rail and two side heads, AC or DC motor drive.

42"x26"x12' INGERSOLL Planer Type milling machine with two heads on adjustable rail and two side heads. AC or DC motor drive.

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38"x38"x14' OHIO Heavy with 2 heads on rail and 1 side head. 230V DC reversing type planer motor & control.

48"x48"x16' NILES - BEMENT - POND Heavy with two heads on rail and two side heads. 230V DC reversing type planer motor and control.

48"x48"x18' G. A. GRAY Spiral Drive with two heads on rail and one side head. AC motor drive with self-contained countershaft.

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48"x48"x32' G. A. GRAY Spiral Drive with two heads on rail and two side heads. 230 Volt DC reversing type planer motor and control.

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48"x48"x20' F. R. PATCH Heavy with two heads on rail and two side heads. 230V DC reversing type motor and control.

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16'x10'x30' BETTS heavy, two heads on rail and two side heads, forced feed lubrication. 230 Volt DC reversing type planer motor and control.

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14"x6' Bradford Q.C. Cone drive.

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6" Bilgram Bevel Gear Generator.
18" Gleason Bevel Gear Generator.
No. 1 Schuchart & Schutte Gear Hobber, 3 S.C.D.
No. 1 Adams Farwell Gear Hobber, B.D.

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10"x72" Norton Type C. Hydraulic A.C. Motor.
No. 78 Covel Hanchett Surface Grinder.

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24"x24"x10' Powell Planer, 2 Hds. M.D.
Sipp Single Spindle Drill, 12" O.H.
42" Bullard 2 Heads, Self contained type.
12' Niles Bement Pond, 2 Heads, P.R.T.

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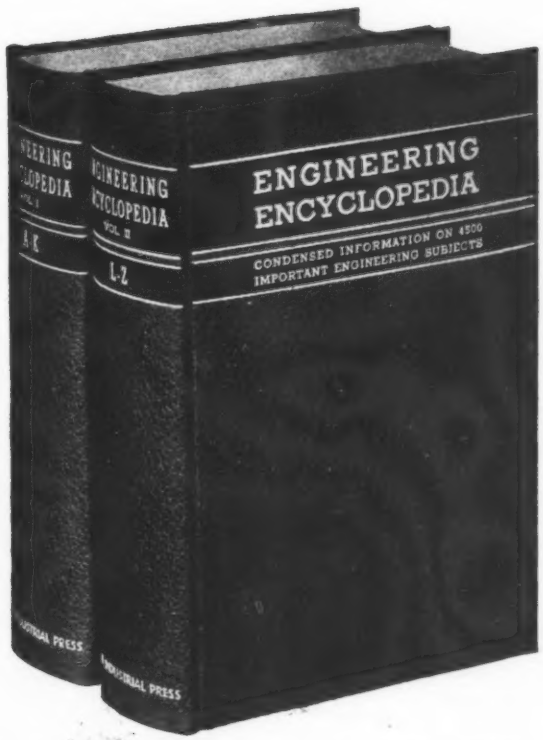

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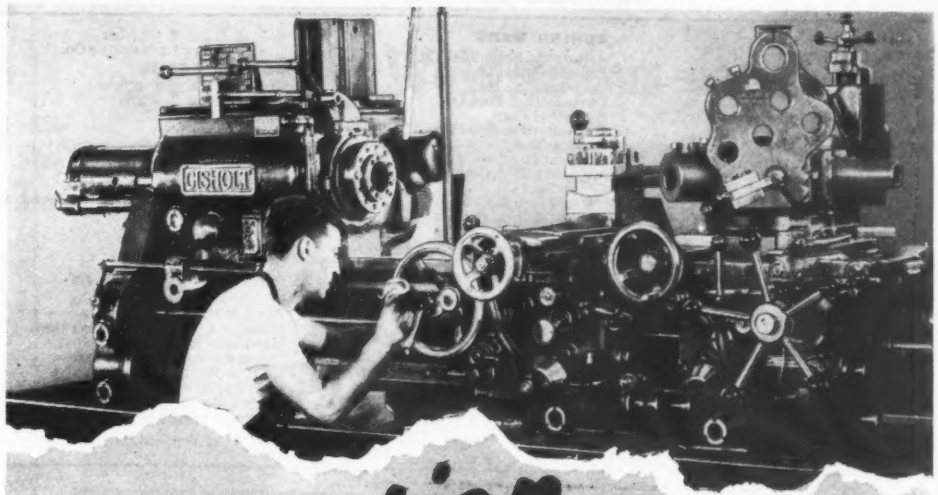

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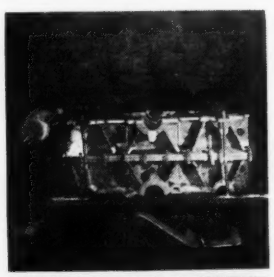
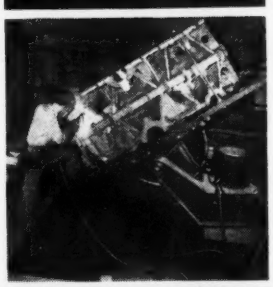
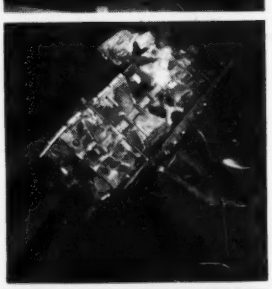
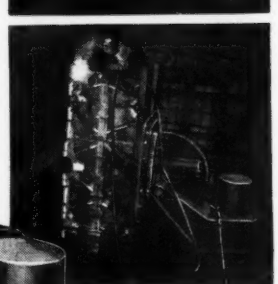
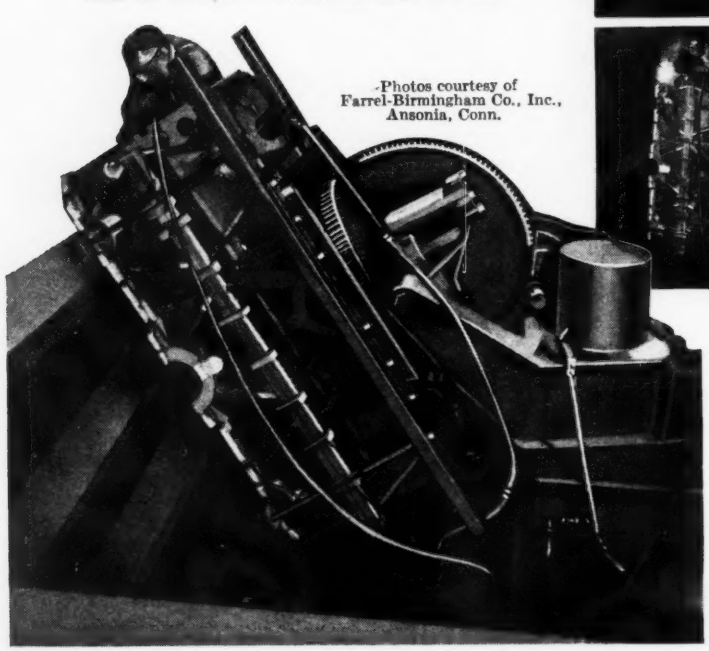










Photos courtesy of Farrel-Birmingham Co., Inc., Ansonia, Conn.

CASTINGS, Brass, Bronze, Aluminum, Magnesium, Etc.
Ampco Metal, Inc.
Bethlehem Steel Co.
(Brass & Bronze only)
Bunting Brass & Bronze Co.
Cramp Brass & Iron Foundries Div.
Shook Bronze Co.
Superior Bearing Bronze Co., Inc.
(Magnesium)

Die
American Brass Co.
Madison-Kipp Corporation
Veeder-Root, Inc.

Gray Iron
Bethlehem Steel Co.
Brown & Sharpe Mfg. Co.
Covel Mfg. Co.

Steel, Alloy, Etc.
Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Birdsboro Steel Fdry. & Mch. Co.
Cramp Brass & Iron Foundries Div.
Lebanon Steel Foundry

CASTING, STEEL, ALLOY, ETC.
American Brake Shoe Co.

CEMENT, Disc Grinding Wheel
Besly, Chas. H., & Co.
Gardner Machine Co.
Hendey Machine Co.
Walls Sales Corp.

CENTERING MACHINES
Consolidated Mch. Tool Corp.
Cross Co.
Espen-Lucas Machine Works
Hanson-Whitney Machine Co.
Jones & Lamson Mch. Co.
Pratt & Whitney Co.

CENTERS, Lathe
Carboloy Co., Inc.
Firth-Sterling Steel Co.
Kennametal, Inc.
Morse Twist Drill & Mch. Co.
Scully-Jones & Co.
Standard Tool Co.
Super Tool Co.

Planer and Miller
Cincinnati Planer Co.

CHAIN DRIVES
Morse Chain Co.

CHAINS, Power Transmission and Conveyor
Boston Gear Works, Inc.
Philadelphia Gear Works

CHAMFERING MACHINES, Gear Tooth
Bilgram Gear & Mch. Works
Consolidated Mch. Tool Corp.
Cross Co.
Grant Mfg. & Mch. Co.
Lipe-Rollway Corp.
Schatz Mfg. Co.

CHIP WRINGERS
Tolhurst Centrifugal Div., American Machine & Metals, Inc.

CHISELS AND CHISEL BLANKS, Pneumatic Hammer
Bethlehem Steel Co.

CHUCKING MACHINES
Bardons & Oliver, Inc.
Baird Machine Co.
Bullard Company
Cleveland Automatic Machine Co.
Gisholt Machine Co.
Goss & DeLeeuw Mch. Co.
Heald Machine Co.
Jones & Lamson Machine Co.
National Acme Co.
New Britain-Gridley Mch. Div.
Potter & Johnston Mch. Co.
Sundstrand Mch. Tool Co.
Warner & Swasey Co.

Multiple Spindle
Goss & De Leeuw Mch. Co.
National Acme Co.
New Britain-Gridley Mch. Div.

CHUCKS, Air Operated
Anker-Holth Mfg. Co.
Hannifin Mfg. Co.
Hufford Machine Works, Inc.
Logansport Machine Co., Inc.
Redmer Air Devices Corp.
Skinner Chuck Co.

Collet or Split
See Collets.

Diaphragm
Van Norman Co.

Drill
Cleveland Twist Drill Co.
Ettco Tool Co.
Jacobs Mfg. Co.
Lee, K. O., & Son Co.
McCrosky Tool Corp.
Modern Tool Works
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Procunier Safety Chuck Co.
Scully-Jones & Co.
Skinner Chuck Co.
Standard Tool Co.

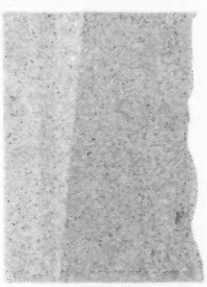
Full Floating
Errington Mechanical Laboratory
Gisholt Mch. Co.
Scully-Jones & Co.

Gear
LeMaire Tool & Mfg. Co.

525 Lap Weld seams per HOUR!

By equipping this resistance welding machine with EIGHT*

"AIRGRIP" Non-Rotating Cylinders on Resistance Welding Machine of the Resistance Welder Corp., Bay City, Mich. Either end of the "AIRGRIP" Non-Rotating Cylinder can be removed, leaving rest completely assembled.



* On this welding machine the "AIRGRIP" Cylinders operate in pairs because two cylindrical containers are welded simultaneously.

AIRGRIP Dual Action

NON-ROTATING CYLINDERS

Production capacity is stepped up, makes lap weld seams on 525 cylindrical containers in one hour!—and quality, uniformity and smoothness of welds are improved. "AIRGRIP" Cylinders do four jobs: (1) They clamp the work. (2) They unclamp it. (3) They lock fixtures. (4) They apply welding pressure.

"AIRGRIP" Cylinders have no tie-rods. Ample strength is provided by making the metal of cylinder walls extra thick—⅜ of an inch.

"AIRGRIP" Non-Rotating Cylinders speed production in many ways. Tell us about your machine operations. Our engineers will investigate your requirements and make recommendations.

OTHER ANKER-HOLTH COST REDUCERS

"AIRGRIP" Chucks and Rotating Cylinders, Air-operated Collets, Arbors, Mandrels, Drill Press Chucks, 2- and 3-jaw Finger and Compensating Chucks, Lubricating Assemblies, 3- or 4-way Air Valves (hand or foot operated), etc. Also Hydraulic Power Units and Fittings.

Representatives in all principal cities. Write for Bulletins.

ANKER-HOLTH MFG. COMPANY
2727 Connors Street • Port Huron, Michigan

When buying new lathes, specify "AIRGRIP" Chucks and Cylinders

Lathe, Etc.
Anker-Holth Mfg. Co.
Bullard Company
Cushman Chuck Co.
Gisholt Mch. Co.
Jones & Lamson Mch. Co.
Rivett Lathe & Grinder, Inc.
Scherr, George, Co., Inc.
Skinner Chuck Co.
Warner & Swasey Co.

Magnetic
Arter Grinding Machine Co.
Brown & Sharpe Mfg. Co.
Hanchett Mfg. Co.
Taft-Peirce Mfg. Co.
Walker, O. S., Co., Inc.

Quick Change and Safety
Errington Mechanical Laboratory
Lee, K. O., & Son Co.
McCrosky Tool Corp.
Modern Tool Works
National Tool Co.
Procunier Safety Chuck Co.
Scully-Jones & Co.

Ring Wheel
Bridgeport Safety Emery Wheel Co., Inc.
Gardner Machine Co.

Tapping
Barber-Colman Co.
Errington Mechanical Laboratory
Greenfield Tap & Die Corp.
Jacobs Mfg. Co.
McCrosky Tool Corp.
Procunier Safety Chuck Co.
Scully-Jones & Co.
Skinner Chuck Co.

CIRCUIT BREAKERS
General Electric Co.
Spencer Thermostat Co.
Westinghouse Electric Corp.

CLAMPS
Armstrong Brothers Tool Co.
Baumbach, E. A., Mfg. Co.
Besly, Chas. H., & Co.
Brown & Sharpe Mfg. Co.
Danly Machine Specialties, Inc.
Grand Specialties Co.
Starrett, L. S., Co.
Williams, J. H., & Co.

CLEANERS, Chemical, for Metal
Bullard Co., Bullard-Dunn Process Div.
Oakite Products, Inc.

CLEANERS, Floor, Oil Absorbent
Safety & Maintenance Co.
Waverly Petroleum Products Co.

CLUTCHES
Barnes Drill Co.
Clearing Mch. Corp.
Farrel-Birmingham Co., Inc.
Flaton Machine Works
Foote Bros. Gear & Machine Corp.
Hill Acme Co.
Hilliard Corp.
Johnson, Carlyle, Machine Co.
Lipe-Rollway Corp.
Morse Chain Co.
Rockford Clutch Div.
Twin Disc Clutch Co.

COATINGS, PROTECTIVE
Bakelite Corp.
Bullard Co., Bullard-Dunn Process Div.

COLLARS, Safety
Hill Acme Co.
Standard Pressed Steel Co.

Spacings, Etc.
Scully-Jones & Co.

COLLETS
Ames, B. C., Co.
Anker-Holth Mfg. Co.
Brown & Sharpe Mfg. Co.
Cleveland Twist Drill Co.
Gisholt Mch. Co.
Hannifin Mfg. Co.
Hardinge Brothers, Inc.
Jones & Lamson Mch. Co.
Modern Tool Wks.
New Britain-Gridley Mch. Div., New Britain Machine Co.
Pratt & Whitney Co.
Rivett Lathe & Grinder, Inc.
Scully-Jones & Co.
Standard Tool Co.
Union Twist Drill Co.
Warner & Swasey Co.

COMPARATORS—
See Gages, Comparator.

COMPARATORS, Screw Thread
Jones & Lamson Mch. Co.
Scherr, George, Co., Inc.
Triplex Machine Tool Corp.

COMPOUNDS, Cleaning
American Solder & Flux Co.
Oakite Products, Inc.

Cutting, Grinding, Metal Drawing, Etc.
Cities Service Oil Co.
Gulf Oil Corp.
National Broach & Mch. Co. (Broaching and Lapping)
Oakite Products, Inc.
Richards, G. Whitfield
Snell Oil Co., Inc.
Standard Oil Co., (Indiana)
Stuart, D. A., Oil Co., Ltd.
Sun Oil Co.
Texas Co.
Tide Water Associated Oil Co.

Galvanizing
American Solder & Flux Co.

Resin or Molding
Bakelite Corp.
Durez Plastics & Chemicals, Inc.
General Electric Co.

COMPRESSORS, Air
DeLaval Steam Turbine Co.
Ingersoll-Rand Co.

CONTRACT WORK
Ace Manufacturing Corp.
Columbus Die, Tool & Mch. Co.
Diefendorf Gear Corp.
Ex-Cell-O Corp.
Hartford Special Mchry. Co.
Hill Acme Co.
Kaydon Engrg. Corp.
Langelier Mfg. Co.
LeBlond, R. K., Mch. Tool Co.
Lees-Bradner Co.
Mummert-Dixon Co.
National Acme Co.
Rockford Machine Tool Co.
Taft-Peirce Mfg. Co.
U. S. Tool Co., Inc.

CONTROLLERS
Allen-Bradley Co.
Bristol Co.
Clark Controller Co.
General Electric Co.
Westinghouse Electric Corp.

CONVEYOR SYSTEMS
Link-Belt Co.

COUNTERBORES
Carboloy Co., Inc.
Cleveland Twist Drill Co.
Ex-Cell-O Corporation.
Firth-Sterling Steel Co.
Gairing Tool Co.
Genesee Tool Co.
Haynes Stellite Co.
Kennametal, Inc.
Morse Twist Drill & Mch. Co.
National Tool Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Scully-Jones & Co.
Standard Tool Co.
Starrett, L. S., Co.
Super Tool Co.
Union Twist Drill Co.

COUNTERSHAFTS
Hill Acme Co.
LeBlond, R. K., Mch. Tool Co.
Standard Pressed Steel Co.
Warner & Swasey Co.

COUNTERSINKS
Cogsdill Twist Drill Co.
Ex-Cell-O Corp.
Gairing Tool Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Scully-Jones & Co.
Standard Tool Co.
Super Tool Co.
Union Twist Drill Co.

COUNTERS, Revolution
Bristol Co.
Brown & Sharpe Mfg. Co.
Starrett, L. S., Co.
Veeder-Root, Inc.

COUNTING DEVICES
Starrett, L. S., Co.
Veeder-Root, Inc.

COUPLINGS, Flexible
Atlantic Gear Works, Inc.
Baldor Electric Co.
Boston Gear Works, Inc.
Eberhardt-Denver Co.
Farrel-Birmingham Co., Inc.
Foote Bros. Gear & Machine Corp.
Hill Acme Co.
James, D. O., Mfg. Co.
Lovejoy Flexible Coupling Co.

HAVE A HANNA RIVETING PRESS

Tailored to YOUR Job!

. . . for better riveting, faster

When you want maximum production and good clean riveting on a job—have Hanna build a riveting press *especially* for it. Hanna has over 40 years experience in designing and building riveting presses for all types of applications. They have produced over 500 styles and sizes, pneumatic and hydraulic, to handle rivets from 3/16″ to 1 1/2″ in diameter. The 15 ton Hanna Press shown here has a 12″ reach, 12″ gap and will drive 5/16″ diameter rivets cold; it solved a special riveting problem.

Discuss your riveting requirements with Hanna—just send a description of your work with blue prints—or a sample if you can.

Send for this Hanna Riveter Catalog No. 232

It covers the broad line of HANNA Riveters. There are Portable and Stationary Types available in over 700 styles and sizes for driving hot or cold rivets from ⅛″ to 2½″ in diameter—throat or reach from 2 in. up to 21 ft. . . . *of course it's free to executives and engineers.*

HANNA ENGINEERING WORKS
1765 ELSTON AVENUE CHICAGO 22, ILLINOIS
Air & Hydraulic RIVETERS CYLINDERS • HOISTS

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Philadelphia Gear Works

Pipe, Tubes, Etc.

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Shaft

Boston Gear Works, Inc.
Foote Bros. Gear & Machine Corp.
Hill Acme Co.
Hilliard Corp.
Sellers, Wm., & Co., Inc.
Standard Pressed Steel Co.

CRANES, Electric Traveling

Morgan Engineering Co.
Shepard Niles Crane & Hoist Corp.

Hand Traveling

Shepard Niles Crane & Hoist Corp.

Locomotives

Cullen-Friestedt Co.
Hill Acme Co.

CUTTER GRINDERS

See Grinding Machines, Universal, for Sharpening Cutters, Reamers, Hobs, Etc.

CUTTERS, Gear

Brown & Sharpe Mfg. Co.
Ex-Cell-O Corp.
Fellows Gear Shaper Co.
Illinois Tool Works
Michigan Tool Co.
Morse Twist Drill & Mch. Co.
National Broach & Mch. Co.
(Gear Shaper)
National Tool Co.
National Twist Drill & Tool Co.
O. K. Tool Co., Inc.
Pratt & Whitney Co.
Standard Tool Co.
Union Twist Drill Co.
U. S. Machine Tool Mfg. Corp.
Waltham Mch. Wks.

Milling

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Brown & Sharpe Mfg. Co.
Carboloy Co., Inc.
Columbus Die, Tool & Machine Co.
Detroit Tap & Tool Co.
Ex-Cell-O- Corp.
Firth-Sterling Steel Co.
Ford, M. A., Mfg. Co.
Gairing Tool Co.
Gammons-Hoaglund Co.
Genesee Tool Co.
Gorton, George, Mch. Co.
Haynes Stellite Co.
Illinois Tool Works
Ingersoll Milling Mch. Co.
Kearney & Trecker Corp.
Kennametal, Inc.
McCrosky Tool Corp.
Modern Tool Wks.
Morse Twist Drill & Mch. Co.
National Tool Co.
National Twist Drill & Tool Co.
O. K. Tool Co., Inc.
Onsrud Machine Works, Inc.
Pratt & Whitney Co.
Producto Machine Co.
Reed-Prentice Corp.
Scully-Jones Co.
Sossner Tap & Tool Corp.
Standard Tool Co.
Super Tool Co.
Union Twist Drill Co.
U. S. Machine Tool Mfg. Corp.

CUTTING COMPOUNDS

See Compounds, Cutting, Grinding, Etc.

CUTTING-OFF MACHINES

Avey Drilling Machine Co.
Bardons & Oliver, Inc.
Bridgeport Safety Emery Wheel Co., Inc.
Brown & Sharpe Mfg. Co.
Consolidated Mch. Tool Corp.
Landis Machine Co.

Abrasive Wheel

Armstrong Brothers Tool Co.
Bridgeport Safety Emery Wheel Co., Inc.
Campbell, Andrew C., Div. American Chain & Cable Co., Inc.
Covel Mfg. Co.
Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc.

Cold Saw

See Sawing Machines, Circular.

CUTTING-OFF TOOLS

Armstrong Brothers Tool Co.
Empire Tool Co.
Firth-Sterling Steel Co.
General Aircraft Equipment, Inc.
Haynes Stellite Co.
Illinois Tool Works
Luers, J. Milton
Pratt & Whitney Co.
U. S. Machine Tool Mfg. Corp.
Williams, J. H., & Co.

CUTTING-OFF WHEELS, Abrasive

Bay State Abrasive Co.
Norton Co.

CYLINDER BORING MACHINES

Baker Brothers, Inc.
Barnes Drill Co.
Consolidated Mch. Tool Corp.
Cross Co.
Ex-Cell-O Corp.
Ingersoll Milling Mch. Co.
Moline Tool Co.
Sellers, Wm., & Co., Inc.

CYLINDERS, Hydraulic

American Hollow Boring Co.
Anker-Holth Mfg. Co.
Barnes, John S., Corp.
Clearing Mch. Co.
Denison Engineering Co.
Galland-Henning Mfg. Co.

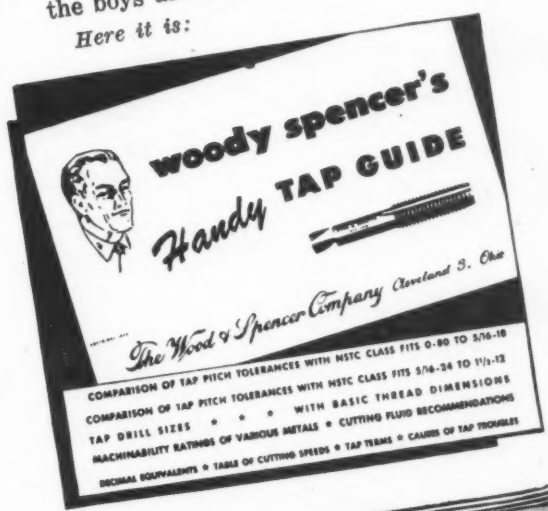
TAPPING TIPS*

From Woody Spencer's Notebook

Look, Pal — Here's Some Real Tapping Help

Here's a new idea I've worked up to help make tapping jobs easier. I've packed it full of all the information I could get together—all the things the boys are asking me about.

Here it is:


woody spencer's
Handy TAP GUIDE
The Wood & Spencer Company Cleveland 3, Ohio
COMPARISON OF TAP PITCH TOLERANCES WITH NSTC CLASS FITS 0-80 TO 5/16-18
COMPARISON OF TAP PITCH TOLERANCES WITH NSTC CLASS FITS 5/16-24 TO 1"/2-12
TAP DRILL SIZES • • • WITH BASIC THREAD DIMENSIONS
MACHINABILITY RATINGS OF VARIOUS METALS • CUTTING FLUID RECOMMENDATIONS
DECIMAL EQUIVALENTS • TABLE OF CUTTING SPEEDS • TAP TERMS • CAUSES OF TAP TROUBLES

Maybe this new pin-up of mine doesn't have all the curves of some others I could name, but it does have all the angles—tapping angles I mean. It's new. It's attractive. It's colorful. And it's strong on job appeal. It shows comparisons of tap pitch tolerances with NSTC class fits. It shows tap drill sizes, basic thread dimensions, machinability ratings of various metals, cutting fluid recommendations, recommended cutting speeds, decimal equivalents, tap terms and a lot of the common causes of tap troubles. And the whole thing is indexed and arranged for quick, easy reference. Just lift the tab and there's your information. It's designed to hang up on the wall in the tool crib, in the shop or the engineering department. I think everyone interested in tapping is going to find it mighty handy. And, of course, it's FREE.

SEND FOR YOUR COPY ON THE COMPANY LETTERHEAD

Just address me care of this Company

Woody Spencer

THE RIGHT TAP AT THE RIGHT TIME

The Wood & Spencer Company
Cleveland 3, Ohio

Hanna Engrg. Works
Hannifin Mfg. Co.
Hydraulic Press Mfg. Co.
Hydraulic Products Co.
Logansport Machine Co., Inc.
Rockford Machine Tool Co.
Skinner Chuck Co.

Pneumatic

Anker-Holth Mfg. Co.
Clearing Mch. Corp.
Hanna Engrg. Works
Hannifin Mfg. Co.
Hydraulic Products Co.
Skinner Chuck Co.

DEALERS, Machinery

Besly, Chas. H., & Co.
Earle Gear & Mch. Co.
Interstate Machinery Co.
Lucas, J. L., & Son, Inc.
Lunden & Bonthron
Ryerson, Joseph T., & Son, Inc.
Simmons Machine Tool Corp.

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Heald Machine Co.
Walker, O. S., Co., Inc.

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Ex-Cell-O Corp.
Hartford Special Mchry. Co.
Ruthman Mchry. Co.

DIAMONDS and Diamond Tools

Desmond-Stephan Mfg. Co.
Diamond Tool Co.
Smit, J. K., & Co.
Super Tool Co.

DIE CASTING MACHINES

Hydraulic Press Mfg. Co.
Kux Machine Co.
Lester-Phoenix, Inc.
Madison-Kipp Corp.
Reed-Prentice Corp.

DIE CASTING

See Castings, Die.

DIE CUSHIONS, Pneumatic

Clearing Mch. Corp.

DIE INSERTS, Carbide

Carboloy Co., Inc.
Firth-Sterling Steel Co.
Kennametal, Inc.

DIE MAKERS' SUPPLIES

Baumbach, E. A., Mfg. Co.
Danly Mch. Specialties, Inc.
U. S. Machine Tool Mfg. Corp.
U. S. Tool Company, Inc.

DIE MAKING MACHINES

Grob Brothers
Kearney & Trecker Corp.
Oliver Instrument Co.

DIE SETS, Standard

Baumbach, E. A., Mfg. Co.
Danly Mch. Specialties, Inc.
Pratt & Whitney Co.
Producto Machine Co.

DIE SINKING MACHINES

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Gorton, George, Mch. Co.
Pratt & Whitney Co.
Reed-Prentice Corp.

DIE SINKING PRESSES

Baldwin-Southwark Corp.
Kearney & Trecker Corp.

DIE STOCKS

See Stocks, Die.

DIES, Lettering and Embossing

Noble & Westbrook Mfg. Co.
Sossner Steel Stamps

DIES, Sheet Metal, Etc.

Baumbach, E. A., Mfg. Co.
Columbus Die, Tool & Mch. Co.
Niagara Mch. & Tool Wks.
Peck, Stow & Wilcox Co.
Pioneer Pump & Mfg. Co.
Ruthman Mchry. Co.
Taft-Peirce Mfg. Co.
V & O Press Co.
Waltham Mch. Wks.

Threading

Butterfield Div. Union Twist Drill Co.
Card, S. W., Mfg. Co.
Eastern Mch. Screw Corp.
Geometric Tool Co.
Greenfield Tap & Die Corp.
Hill Acme Co.
Jones & Lamson Mch. Co.
Landis Mch. Co., Inc.
Modern Tool Works
Morse Twist Drill & Mch. Co.
National Acme Co.
Oster Manufacturing Co.
Pratt & Whitney Co.
Standard Tool Co.

Threading Opening

Eastern Mch. Screw Corp.
Errington Mechanical Laboratory
Geometric Tool Co.
Hill Acme Co.
Jones & Lamson Mch. Co.
Landis Mch. Co., Inc.
Modern Tool Works
National Acme Co.
Oster Manufacturing Co.

Thread Rolling

Hanson-Whitney Mch. Co.
Pratt & Whitney Co.
Rolled Thread Die Co.

DISCS, Abrasive

Abrasive Co.
Besly, Chas. H., & Co.
Gardner Mch. Co.
Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc.
Norton Co.
Walls Sales Corp.

DIVIDING HEADS

See Index Centers.

DOWEL PINS

Allen Mfg. Co.
Baumbach, E. A., Mfg. Co.
Danly Mch. Specialties, Inc.
U. S. Tool Co., Inc.

DRAFTING MACHINES

Universal Drafting Machine Co.

DRAWING BOARDS and TABLES

Universal Drafting Machine Co.

DRESSERS, Grinding Wheel

American Gauge Co.
Carboloy Co., Inc.
Desmond-Stephan Mfg. Co.
Diamond Tool Co.
Hanchett Mfg. Co.
J & S Tool Co.
Lee, K. O., & Son Co.
Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc.
Norton Co.
Smit, J. K., & Co.
Standard Tool Co.
Super Tool Co.
Vinco Corporation

DRIFTS, DRILL

Armstrong Bros. Tool Co.
Standard Tool Co.

DRILL HEADS, Unit Type

Barnes Drill Co.
Rehnberg-Jacobson Mfg. Co.

Multiple

Baker Brothers, Inc.
Barnes Drill Co.
Buffalo Forge Co.
Buhr Machine Tool Co.
Chicago Drillet Corp.
Errington Mechanical Laboratory
Ettco Tool Co.
Ex-Cell-O Corp.
Hoefer Mfg. Co.
Langelier Mfg. Co.
Moline Tool Co.
Thriftmaster Products, Div. Thomson Industries, Inc.

DRILL SOCKETS

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Cleveland Twist Drill Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Scully-Jones & Co.
Standard Tool Co.
Union Twist Drill Co.

DRILL SPEEDERS

Graham Mfg. Co., Inc.
Hoefer Mfg. Co.

DRILL STANDS

Cleveland Twist Drill Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.

"Make this part of your stamping spex!"

COMPLETE-PER-STROKE

ON HENRY & WRIGHT DIEING MACHINES

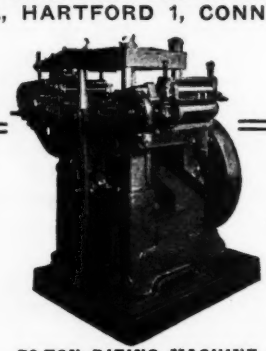
It is a fact that MANY stampings formerly considered too complicated, are today being made complete-per-stroke on Dieing Machines. Start every stamping with the premise that it can be worked out for complete-per-stroke production on progressive dies. The Dieing Machine has unique construction and does unusual things. In precision of feed and die register it is exceptional. Frequently we work out uncommon steps, such as broaching, or plan for stamping a part usually produced by machining. Savings are substantial. Dies last 600% longer on the average. Precision of product can consistently be held within .0002" limits when needed. If your stamping CAN be made a more economical way, YOU WANT TO KNOW IT! We gladly offer every possible assistance.

THE HENRY & WRIGHT MFG. CO.
467 WINDSOR ST., HARTFORD 1, CONN.

REQUEST LATEST CATALOG NO. 45

Motor base produced complete one per stroke from 16 gauge steel. Dimensions 6¾" x 5" x 1¾".

Novelty jewelry pierced piece produced on Dieing Machine.



50-TON DIEING MACHINE
Other capacities: 10 tons to 300 tons.

HENRY & WRIGHT DIEING MACHINES

Standard Tool Co.
Union Twist Drill Co.

DRILLING MACHINES, Automatic
Avey Drilling Machine Co.
Baker Brothers, Inc.
Barnes Drill Co.
Barnes, W. F. & John, Co.
Bodine Corp.
Bradford Machine Tool Co.
Buhr Machine Tool Co.
Consolidated Mch. Tool Corp.
Cross Co.
Grant Mfg. & Mch. Co.
Hoefer Mfg. Co.
Kingsbury Mch. Tool Corp.
Langelier Mfg. Co.

Bench
Ames, B. C., Co.
Atlas Press Co.
Avey Drilling Machine Co.
Buffalo Forge Co.
Dumore Co.
Elgin Tool Wks., Inc.
Fosdick Machine Tool Co.
Henry & Wright Mfg. Co.
Langelier Mfg. Co.
Leland-Gifford Co.
Moline Tool Co.
Production Machine Co.
Walker-Turner Co., Inc.

Boiler
Cincinnati Bickford Tool Co.
Foote-Burt Co.
Sellers, Wm., & Co., Inc.

Gang
Avey Drilling Machine Co.
Baker Brothers, Inc.
Barnes Drill Co.
Cincinnati Bickford Tool Co.
Consolidated Mch. Tool Corp.
Cross Co.
Foote-Burt Co.
Fosdick Machine Tool Co.
Ingersoll Milling Mch. Co.
Langelier Mfg. Co.
Leland-Gifford Co.
Moline Tool Co.
Production Machine Co.
Producto Machine Co.

Horizontal Duplex
Avey Drilling Machine Co.
Baker Brothers, Inc.
Barnes Drill Co.
Barnes, W. F. & John, Co.
Bradford Machine Tool Co.
Consolidated Mch. Tool Corp.
Cross Co.
Davis & Thompson Co.
Frew Machine Co.
Kingsbury Mch. Tool Corp.
Langelier Mfg. Co.
Sellers, Wm., & Co., Inc.
Sundstrand Mch. Tool Co.

Inverted
Baker Brothers, Inc.
Barnes Drill Co.

Multiple Center Column Type
Barnes Drill Co.

Multiple Spindle
Avey Drilling Machine Co.
Baker Brothers, Inc.
Barnes Drill Co.
Barnes, W. F. & John, Co.
Baush Machine Tool Co.
Bradford Machine Tool Co.
Buffalo Forge Co.
Buhr Machine Tool Co.
Cincinnati Bickford Tool Co.
Cross Co.
Foote-Burt Co.
Fosdick Machine Tool Co.
Greenlee Bros. & Co.
Henry & Wright Mfg. Co.
Ingersoll Milling Mch. Co.
Kingsbury Mch. Tool Corp.
Langelier Mfg. Co.
Leland-Gifford Co.
Moline Tool Co.
Pratt & Whitney Co.
Production Mch. Co.
Sellers, Wm., & Co., Inc.

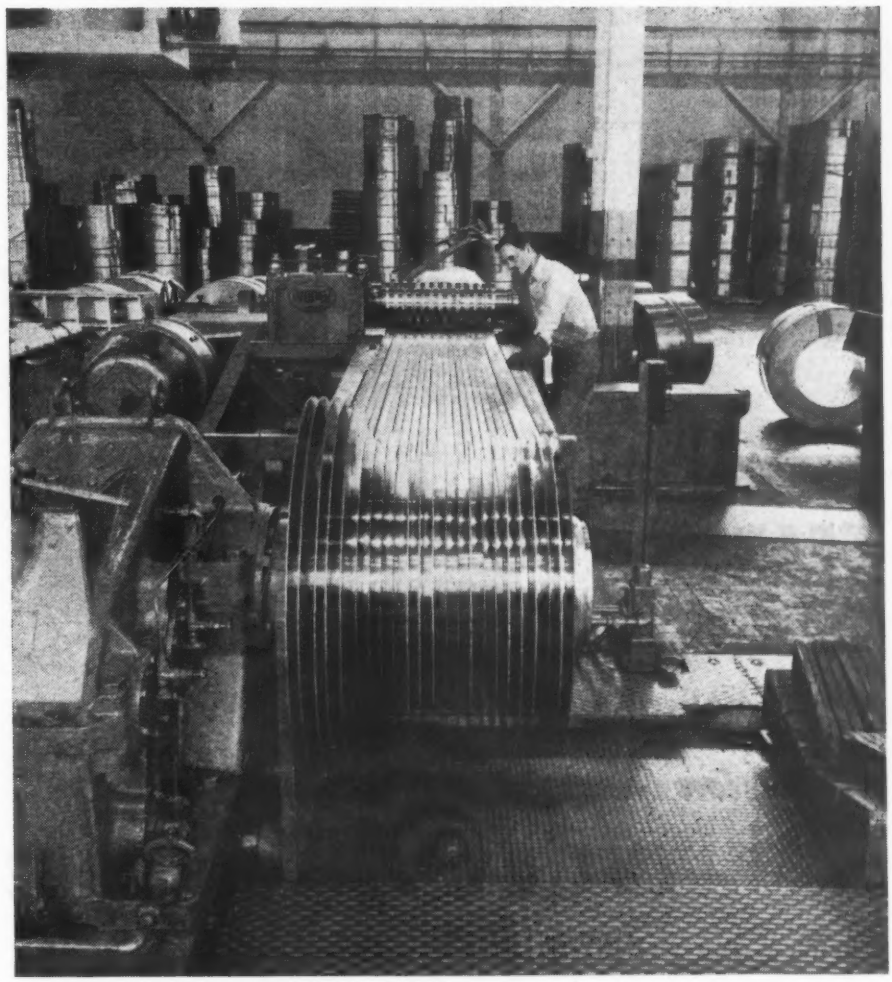
Radial
American Tool Wks. Co.
Carlton Machine Tool Co.
Cincinnati Bickford Tool Co.
Foote-Burt Co.
Fosdick Machine Tool Co.
Giddings & Lewis Mch. Tool Co.
Onsrud Machine Works, Inc.
Sellers, Wm., & Co., Inc.

Rail
See Drilling Machines, Gang.

Sensitive
Atlas Press Co.
Avey Drilling Machine Co.
Buffalo Forge Co.
Foote-Burt Co.
Fosdick Machine Tool Co.
Henry & Wright Mfg. Co.
Langelier Mfg. Co.
Leland-Gifford Co.
Moline Tool Co.
Pratt & Whitney Co.
Production Mch. Co.
Producto Machine Co.
Rivett Lathe & Grinder, Inc.
Ryerson, Joseph T., & Son, Inc.

Upright
Atlas Press Co.
Avey Drilling Machine Co.
Baker Brothers, Inc.

IF YOU HANDLE SHEET METAL—



YODER MACHINES WILL SPEED YOUR PRODUCTION

● If you handle metal, in sheet, strip or coils . . . whether you roll it, convert it, job it or fabricate it . . . make ash cans or aircraft sections, doohickies or dump trucks . . . there is Yoder machinery to make the handling or fabricating easier and more profitable. Yoder's specialty is high production metal working machinery, from slitters and coilers to cold forming mills for 24" resistance weld pipe. If we don't have the right machinery for your metal handling problem, we can design and build it for you.

ASK FOR A YODER BULLETIN

ENGINEERING YODER MANUFACTURING

The YODER COMPANY

METAL WORKING PRODUCTION MACHINERY

5504 WALWORTH AVE. CLEVELAND 2, OHIO

Barnes Drill Co.
Barnes, W. F. & John, Co.
Buffalo Forge Co.
Cincinnati Bickford Tool Co.
Consolidated Mch. Tool Corp.
Cross Co.
Davis & Thompson Co.
Foote-Burt Co.
Fosdick Machine Tool Co.
Hoefer Mfg. Co.
Ingersoll Milling Mch. Co.
Langelier Mfg. Co.
Leland-Gifford Co.
Moline Tool Co.
Production Mch. Co.
Producto Machine Co.
Rehnberg-Jacobson Mfg. Co.
Rogers Machine Works, Inc.
Ryerson, Joseph T., & Son, Inc.
Sellers, Wm., & Co., Inc.

Wall Radial

Cleveland Punch & Shear Works Co.
Consolidated Mch. Tool Corp.

DRILLS, Center

Cleveland Twist Drill Co.
Cogsdill Twist Drill Co.
Gairing Tool Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Standard Tool Co.
Union Twist Drill Co.
Warner & Swasey Co.

Core

Carboloy Co., Inc.
Ex-Cell-O Corp.
Firth-Sterling Steel Co.
Gairing Tool Co.
Haynes Stellite Co.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Scully-Jones & Co.
Standard Tool Co.
Super Tool Co.
Union Twist Drill Co.

Portable Electric

Dumore Co.
Ryerson, Joseph T., & Son, Inc.

Portable Pneumatic

Ingersoll-Rand Co.
Onsrud Machine Works, Inc.
Rotor Tool Co.
Skilsaw, Inc.

Ratchet

Armstrong Bros. Tool Co.
Cleveland Twist Drill Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Standard Tool Co.
Union Twist Drill Co.

Twist

Black Drill Co.
Carboloy Co., Inc.
Clark Equipment Co.
Cleveland Twist Drill Co.
Cogsdill Twist Drill Co.
Firth-Sterling Steel Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Republic Drill & Tool Co.
Standard Tool Co.
Super Tool Co.
Union Twist Drill Co.

Wire

Cogsdill Twist Drill Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Standard Tool Co.
Union Twist Drill Co.

DRIVES, Motorized Belt

Cullman Wheel Co.

DUPLICATORS

Rockford Machine Tool Co.

DUST CONTROL SYSTEMS

Covel Mfg. Co.
Pangborn Corp.
Schneible, Claude B., Co.

ELECTRICAL EQUIPMENT

General Electric Co.
Westinghouse Electric Corp.

ELEVATORS

Otis Elevator Co.

EMERY WHEELS

See Grinding Wheels.

EMERY WHEEL DRESSERS

See Dressers, Grinding Wheel.

ENGRAVING MACHINES

Gorton, George, Mch. Co.

EXTRACTORS, Screw

Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.

FACING MACHINE

Ex-Cell-O Corp.

FACING TOOL

Clark, Robert H., Co.

FANS, Exhaust, Electric Ventilating

Buffalo Forge Co.
General Electric Co.
Wagner Electric Co.

FEEDS FOR PRESSES, Automatic

Cleveland Punch & Shear Works Co.
Peck, Stow & Wilcox Co.
S. & S. Machine Wks.
U. S. Tool Co., Inc.
V & O Press Co.

FILES

Nicholson File Co.
Simonds Saw & Steel Co.

Machine

Oliver Instrument Co.

Rotary

Ford, M. A., Mfg. Co.
Haskins, R. G., Co.
Lewis, B. C., Mfg. Co., Inc.
Lincoln Park Industries, Inc.
Pratt & Whitney Co.
Stow Mfg. Co.
Strand, N. A., & Co.

FILTERS, AIR

United States Electrical Tool Co.

FILTERS, COOLANT AND OIL

Briggs Clarifier Co.
Cuno Engineering Corp.

FILING MACHINES, Die, Etc.

Ames, B. C., Co.
DoAll Co.
Grob Brothers
Illinois Tool Wks.
Oliver Instrument Co.
Stow Mfg. Co.

FITTINGS, HYDRAULIC

Hydraulic Press Mfg. Co.
Watson-Stillman Co.

FLEXIBLE COUPLINGS

See Couplings, Flexible.

FLEXIBLE SHAFT EQUIPMENT

Dumore Co.
Haskins, R. G., Co.
Lewis, B. C., Mfg. Co., Inc.
Pratt & Whitney Co.
Stow Mfg. Co.
Strand, N. A., & Co.
Walker-Turner Co., Inc.
Wyzenbeek & Staff, Inc.

FORGING (Upsetting) MCHS.

Ajax Manufacturing Co.
Baldwin-Southwark Corp.
Hill Acme Co.

FORGINGS, Drop

Bethlehem Steel Co.
Drop Forging Association
Williams, J. H., & Co.

Hollow Bored

American Hollow Boring Co.
Bethlehem Steel Co.

Iron and Steel

Bethlehem Steel Co.
Commercial Forgings Co.
Jones & Laughlin Steel Corp.
Morgan Engineering Co.
Steel Improvement & Forge Co.

Manganese, Bronze, Etc.

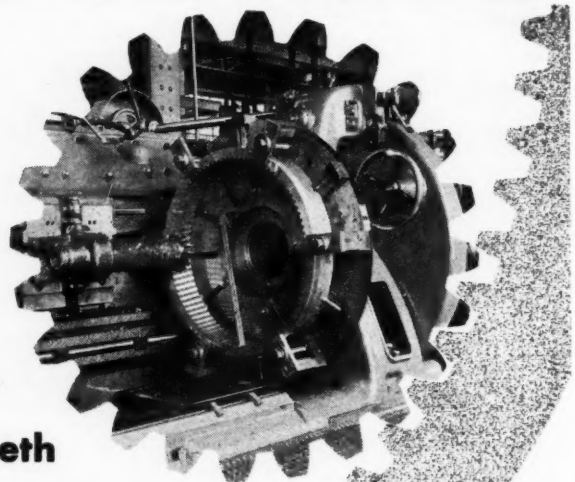
Cramp Brass & Iron Foundries Div.

Upset

Bethlehem Steel Co.
Williams, J. H., & Co.

FORMING AND BENDING MCHS.

Baldwin-Southwark Corp.
Bethlehem Steel Co.
Cincinnati Shaper Co.
Cleveland Punch & Shear Works Co.
Consolidated Mch. Tool Corp.
Hannifin Mfg. Co.
Hydraulic Press Mfg. Co.
O'Neil-Irwin Mfg. Co.
Yoder Co.



INTERNAL GEARS

with straight or single helical teeth

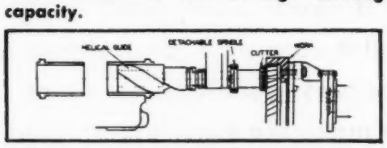
Precision Generated

~~CUT~~ BY THIS MACHINE

Internal gears are part of a wide range of gear products produced with uniform, high precision by the Farrel-Sykes Gear Generator. The gears can have either straight or single helical teeth. A typical set-up for generating an internal gear with helical teeth is shown in the illustrations.

Built with initial precision of the highest order, this machine is capable of turning out consistently precise work at a high rate for 30,000 hours (15 years of normal use) or more. Hardened, ground and lapped surfaces are used where wear could affect precision, and means are provided to compensate for unavoidable wear. Rapid reciprocation of cutters prevents temperature from affecting precision and permits extremely fine finishing cuts to be taken with facility and speed.

The gear manufacturer seeking accuracy of product, economy of operation, speed of production, or diversity of output will find the Farrel-Sykes Gear Generator an efficient machine tool of high earning capacity.



Method of generating internal single helical teeth.

It is available in four sizes for producing gears in various size ranges from 0" to 61" in diameter. Write for complete details.

F B 217

FARREL-BIRMINGHAM COMPANY, INC.
344 VULCAN ST. • BUFFALO, N. Y.

Plants: Ansonia, Derby and Stonington, Conn., Buffalo, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Pittsburgh, Akron, Los Angeles, Tulsa, Houston, Charlotte

FARREL — The Gear with a Backbone

Farrel-Birmingham

FORMING & STAMPING MCHS.
Cincinnati Shaper Co.
U. S. Tool Co., Inc.

FORMING TOOLS or Tool Blanks
Brown & Sharpe Mfg. Co.
Firth-Sterling Steel Co.
National Broach & Mch. Co.
Pratt & Whitney Co.

FRAMES, Machinery, Welded
Mahon, R. C., Co.

FURNACES, Equipment for Loading
Hydraulic Products Co.

Hardness
Leeds & Northrup Co.

Heat-Treating Electric
General Electric Co.
Leeds & Northrup Co.
Westinghouse Electric Corp.

FURNITURE, Shop
Lee, K. O., & Son Co.
Standard Pressed Steel Co.

GAGE BLOCKS
Johansson Div., Ford Motor Co.
Pratt & Whitney Co.
Scherr, George, Co., Inc.
Van Keuren Co.

GAGES, Comparator
American Measuring Instruments Corp.
Comtor Co.
Federal Products Corp.
Jones & Lamson Machine Co.
Pratt & Whitney Co.
Scherr, George, Co.
Sheffield Corp.
Woodworth, N. A., Co.

Depth
Brown & Sharpe Mfg. Co.
Federal Products Corp.
Scherr, George, Co., Inc.
Standard Gage Co., Inc.
Starrett, L. S., Co.

Dial
Ames, B. C., Co.
Bristol Co.
Brown & Sharpe Mfg. Co.
Federal Products Corp.
Scherr, George, Co., Inc.
Sheffield Corp.
Standard Gage Co., Inc.
Starrett, L. S., Co.
Trico Products Corp.

Electric
Pratt & Whitney Co.

Height
Brown & Sharpe Mfg. Co.
Scherr, George, Co., Inc.
Standard Gage Co.
Starrett, L. S., Co.

Plug, Ring and Snap
Allen Gauge & Tool Co.
American Gauge Co.
Axelson Mfg. Co.
Brown & Sharpe Mfg. Co.
Carboloy Co., Inc.
Elgin National Watch Co.
Ex-Cell-O Corp.
Federal Products Corp.
Firth-Sterling Steel Co.
Greenfield Tap & Die Corp.
Haynes Stellite Co.
Kennametal, Inc.
Lincoln Park Industries, Inc.
Merz Engineering Co.
Morse Twist Drill & Machine Co.
Pratt & Whitney Co.
Quality Tool & Die Co.
Scherr, George, Co., Inc.
Sheffield Corp.
Size Control Co.
Standard Gage Co., Inc.
Starrett, L. S., Co.
Van Keuren Co.
Vinco Corp.
Woodworth, N. A., Co.

Surface
Brown & Sharpe Mfg. Co.
Columbus Die, Tool & Mch. Co.
Standard Gage Co., Inc.
Starrett, L. S., Co.

Taper
Brown & Sharpe Mfg. Co.
Johansson Div., Ford Motor Co.
Pratt & Whitney Co.
Sheffield Corp.
Standard Gage Co., Inc.,
Starrett, L. S., Co.

Thread
Allen Gauge & Tool Co.
American Gauge Co.
Axelson Mfg. Co.
Bath, John, & Co., Inc.
Brown & Sharpe Mfg. Co.
Detroit Tap & Tool Co.
Federal Products Corp.
Greenfield Tap & Die Corp.
Hanson-Whitney Machine Co.
Jones & Lamson Machine Co.
Lincoln Park Industries, Inc.
Merz Engineering Co.
Pratt & Whitney Co.
Quality Tool & Die Co.
Sheffield Corp.
Size Control Co.
Sossner Tap & Tool Corp.
Starrett, L. S., Co.
Woodworth, N. A., Co.

GASKETS
Garlock Packing Co.
Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc.

GEAR BLANKS, Non-Metallic
Braun Gear Co.
Ganschow Gear Co.
General Electric Co.
Westinghouse Electric Corp.

GEAR BURNISHING MACHINES
Fellows Gear Shaper Co.

GEAR CHECKING INSTRUMENTS AND EQUIPMENT
Brown & Sharpe Mfg. Co.
Fellows Gear Shaper Co.
Gleason Works
Illinois Tool Works
Michigan Tool Co.
National Broach & Mch. Co.
Pratt & Whitney Co.
Scherr, George, Co.
Triplex Machine Tool Corp.

GEAR CUTTING MACHINES, Bevel (Generator)
Bilgram Gear & Machine Wks.
Gleason Works

(Rotary Cutter)
Newark Gear Cutting Machine Co.
Producto Machine Co.
Waltham Mch. Wks.

GEAR CUTTING MACHINES, Helical and Spur (Hob)
Barber-Colman Co.
Lees-Bradner Co.
Newark Gear Cutting Machine Co.
New Jersey Gear & Mfg. Co.
Triplex Machine Tool Corp.

(Shaper or Planer Type)
Farrel-Birmingham Co., Inc.
Fellows Gear Shaper Co.
National Tool Co.

Shear-speed Type
Michigan Tool Co.

GEAR CUTTING MACHINES, Spiral-Bevel
Gleason Works

GEAR CUTTING MACHINES, Worm and Worm Wheels
Barber-Colman Co.
Fellows Gear Shaper Co.
(Straight and Hourglass Type)
Lees-Bradner Co.
New Jersey Gear & Mfg. Co.
Producto Machine Co.

GEAR FINISHING MACHINES
Fellows Gear Shaper Co.
Michigan Tool Co.

GEAR GRINDING MACHINES
Fitchburg Grinding Mch. Corp.
Gleason Works
Pratt & Whitney Co.

GEAR HARDENING MACHINES
Fellows Gear Shaper Co.
Gleason Works

GEAR LAPPING MACHINES
Fellows Gear Shaper Co.
Gleason Works
Michigan Tool Co.
National Broach & Mch. Co.

GEAR MOTORS
See Speed Reducers.

GEAR SHAVING MACHINES
Fellows Gear Shaper Co.
National Broach & Mch. Co.

GEAR TESTING MACHINERY
Baldwin-Southwark Corp.
Brown & Sharpe Mfg. Co.
Farrel-Birmingham Co., Inc.
Fellows Gear Shaper Co.
Lees-Bradner Co.
National Tool Co.
Newark Gear Cutting Machine Co.
Pratt & Whitney Co.
Scherr, George, Co., Inc.
Vinco Corp.

GEAR TOOTH GRINDING MCHS.
Gear Grinding Machine Co.
Lees-Bradner Co.
Pratt & Whitney Co.
Triplex Machine Tool Corp.

GEAR TOOTH GRINDING REST
Utility Tool & Mfg. Co.

GEARS, Cut
Atlantic Gear Works, Inc.
Automotive Gear Works, Inc.
Baush Machine Tool Co.
Beaver Gear Works, Inc.
Bethlehem Steel Co.
Bilgram Gear & Machine Works
Boston Gear Works, Inc.
Braun Gear Co.
Cincinnati Gear Co.
Cleveland Worm & Gear Co.
DeLaval Steam Turbine Co.
Detroit Bevel Gear Co.
Diefendorf Gear Corp.
Earle Gear & Mch. Co.
Eberhardt-Denver Co.
Fairfield Mfg. Co.
Farrel-Birmingham Co., Inc.
Fellows Gear Shaper Co.
Foote Bros. Gear & Machine Corp.
Ganschow Gear Co.
Gear Specialties
General Electric Co.
Gleason Works
Grant Gear Wks., Inc.
Hartford Special Mchy. Co.
Illinois Gear & Machine Co.
James, D. O., Mfg. Co.
Lees-Bradner Co.
Massachusetts Gear & Tool Co.
Meisel Press Mfg. Co.
Michigan Tool Co.
Newark Gear Cutting Machine Co.
New Jersey Gear & Mfg. Co.
Ohio Gear Co.
Perkins Mch. & Gear Co.
Philadelphia Gear Works
Pittsburgh Gear & Machine Co.
Richmond Hill Gear Co.
Sier-Bath Co.
Stahl Gear & Machine Co.
Taylor Mch. Co.
Westinghouse Electric Corp.

Molded
Foote Bros. Gear & Machine Corp.
Philadelphia Gear Works
Westinghouse Electric Corp.

Rawhide and Non-Metallic
Atlantic Gear Works, Inc.
Boston Gear Works, Inc.
Braun Gear Co.
Cincinnati Gear Co.
Diefendorf Gear Corp.
Earle Gear & Mch. Co.
Foote Bros. Gear & Machine Corp.
Ganschow Gear Co.
General Electric Co.
Grant Gear Works, Inc.
Hartford Special Mchy. Co.
James, D. O., Mfg. Co.
Massachusetts Gear & Tool Co.
Meisel Press Mfg. Co.
Philadelphia Gear Works
Pittsburgh Gear & Machine Co.
Stahl Gear & Machine Co.
Taylor Mch. Co.
Westinghouse Electric Corp.

GENERATORS, ELECTRIC
General Electric Co.
Janette Mfg. Co.
Reliance Electric & Mfg. Co.
Westinghouse Electric Corp.

GOGGLES
American Optical Co.

GRADUATING MACHINES
Gorton, George, Mch. Co.
Noble & Westbrook Mfg. Co.

GREASE
Cities Service Oil Co.
Gulf Oil Corp.
Shell Oil Co., Inc.
Standard Oil Co. (Indiana)
Sun Oil Co.
Texas Co.
Tide Water Associated Oil Co.

GRINDERS, Carbide Tool
Baldor Electric Co.
Oliver Instrument Co.
Sundstrand Mch. Tool Co.

Die and Mold
Consolidated Mch. Tool Corp.
Dumore Co.
Haskins, R. G., Co.
Pratt & Whitney Co.
Stow Mfg. Co.

Oilstone, for Woodworking Tools
Mummert-Dixon Co.

Pneumatic
Ingersoll-Rand Co.
Madison-Kipp Corp.
Onsrud Machine Works
Rotor Tool Co.

Portable Electric and Toolpost
Dumore Co.
Haskins, R. G., Co.
Schauer Machine Co.

GRINDING MACHINES

Abrasive Belt
DoAll Co.
Hill Acme Co.
Mattison Mch. Wks.
Porter-Cable Machine Co.
Production Machine Co.
Walker-Turner Co., Inc.
Walls Sales Corp.

Bench
Atlas Press Co.
Hardinge Brothers, Inc.
Rivett Lathe & Grinder, Inc.
Ryerson, Joseph T., & Son, Inc.
Schauer Machine Co.
Walker-Turner Co., Inc.

Broach
Gear Grinding Machine Co.

Camshaft
Landis Tool Co.
Norton Co.

Carbide Tool
Carboloy Co., Inc.
Ex-Cell-O Corp.
Hager, E. F., & Son
Oliver Instrument Co.

Centerless
Cincinnati Grinders, Inc.
Heald Machine Co.
Landis Tool Co.

Chaser, or Die
Eastern Mch. Screw Corp.
Fitchburg Grinding Mch. Corp.
Geometric Tool Co.
Landis Machine Co., Inc.

Chucking
Bryant Chucking Grinder Co.
Fitchburg Grinding Mch. Corp.

Crankshaft
Landis Tool Co.
Norton Co.

Cylinder
Bryant Chucking Grinder Co.
Heald Machine Co.
Landis Tool Co.

Cylindrical
Arter Grinding Machine Co.
Brown & Sharpe Mfg. Co.
Cincinnati Grinders, Inc.
Fitchburg Grinding Mch. Corp.
Landis Tool Co.
Modern Tool Wks.
(Cons. Mch. Tool Corp.)
Morse Twist Drill & Mch. Co.
Norton Co.
Pratt & Whitney Co.
Rivett Lathe & Grinder, Inc.
Thompson Grinder Co.

Disc
Besly, Chas. H., & Co.
Gardner Machine Co.
Hanchett Mfg. Co.
Porter-Cable Machine Co.
Production Mch. Co.

Drill
Covel Mfg. Co.
Gallmeyer & Livingston Co.
Oliver Instrument Co.
Sellers, Wm., & Co., Inc.
Union Twist Drill Co.

Face
Abrasive Mch. Tool Co.
Diamond Machine Co.
Hanchett Mfg. Co.
Oliver Instrument Co.

Flexible Shaft
See Flexible Shaft Equipment.

Gear Teeth
National Tool Co.

For Sharpening Turning and Planing Tools
Oliver Instrument Co.
Onsrud Machine Works, Inc.
Production Mch. Co.
Sellers, Wm., & Co., Inc.
Walker, O. S., Co., Inc.
Waltham Mch. Wks.

Internal
Bryant Chucking Grinder Co.
Heald Machine Co.
Landis Tool Co.
Modern Tool Wks.
(Cons. Mch. Tool Corp.)
Rivett Lathe & Grinder, Inc.

Jig
Moore Special Tool Co., Inc.

Knife and Shear Blade
Bridgeport Safety Emery Wheel Co., Inc.
Hill Acme Co.

Piston Ring
Arter Grinding Machine Co.
Bridgeport Safety Emery Wheel Co., Inc.
Heald Machine Co.

Profile
Boyar-Schultz Corp.

Pulleys
Abrasive Mch. Tool Co.

Radial, Ball Race, Etc.
Landis Tool Co.

Radius, Link
Consolidated Mch. Tool Corp.
Sundstrand Mch. Tool Co.

Ring Wheel
Besly, Chas. H., & Co.
Bridgeport Safety Emery Wheel Co., Inc.
Gardner Machine Co.

Roll
Farrel-Birmingham Co., Inc.
Landis Tool Co.
Norton Co.

Spline
Fitchburg Grinding Machine Corp.
Gear Grinding Machine Co.

Surface
Abrasive Mch. Tool Co.
Arter Grinding Machine Co.
Blanchard Mch. Co.
Brown & Sharpe Mfg. Co.
Covel Mfg. Co.
DoAll Co.
Foote-Burt Co.
Gallmeyer & Livingston Co.
Gardner Mch. Co.
Hanchett Mfg. Co.
Heald Machine Co.
Hill Acme Co.
Mattison Machine Works
Norton Co.
Pratt & Whitney Co.
Producto Machine Co.
Reid Bros. Co., Inc.
Robot Machinery Co.
Thompson Grinder Co.
Walker, O. S., Co., Inc.

Swing Frame
Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc.

Tap
Ex-Cell-O Corp.
Jones & Lamson Mch. Co.

Thread
Ex-Cell-O Corp.
Jones & Lamson Mch. Co.
Landis Machine Co., Inc.

Universal, for Sharpening Cutters, Reamers, Hobs, Etc.
Barber-Colman Co.
Brown & Sharpe Mfg. Co.
Cincinnati Milling Mch. Co.
Covel Mfg. Co.
DoAll Co.
Douglas Machinery Co., Inc.
Fellows Gear Shaper Co.
(Helical Gear Shaper Cutters)
Fitchburg Grinding Mch. Corp.
Gallmeyer & Livingston Co.
Ingersoll Milling Mch. Co.
Landis Tool Co.
LeBlond, R. K., Mch. Tool Co.
Lee, K. O., & Son Co.
Norton Co.
Oliver Instrument Co.
Pratt & Whitney Co.
Thompson Grinder Co.
Union Twist Drill Co.

Worm
Gear Grinding Machine Co.
Jones & Lamson Mch. Co.
Pratt & Whitney Co.

GRINDING WHEELS
Abrasive Co.
Bakelite Corp.
Bay State Abrasive Co.
Besly, Chas. H., & Co.
Blanchard Mch. Co.
Bridgeport Safety Emery Wheel Co., Inc.
Cortland Grinding Wheels Corp.
Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc.
Norton Co.
Vitrified Wheel Co.

GROOVING TOOL, INTERNAL
Waldes-Kohinoor, Inc.

HAMMERS, Drop
Chambersburg Engineering Co.
Morgan Engineering Co.

Pneumatic
Madison-Kipp Corp.

Power
McKiernan-Terry Corp.
Quickwork-Whiting Div. of Whiting Corp.

Soft
Chambersburg Engineering Co.
S. & H. Soft Hammer Products Co.

Steam
Chambersburg Engineering Co.
Sellers, Wm., & Co., Inc.

HANGERS, Shaft
Boston Gear Works, Inc.
Foote Bros. Gear & Machine Corp.
Hill Acme Co.
Hyatt Bearings Div. General Motors Sales Corp.
Sellers, Wm., & Co., Inc.
S K F Industries, Inc.
Standard Pressed Steel Co.

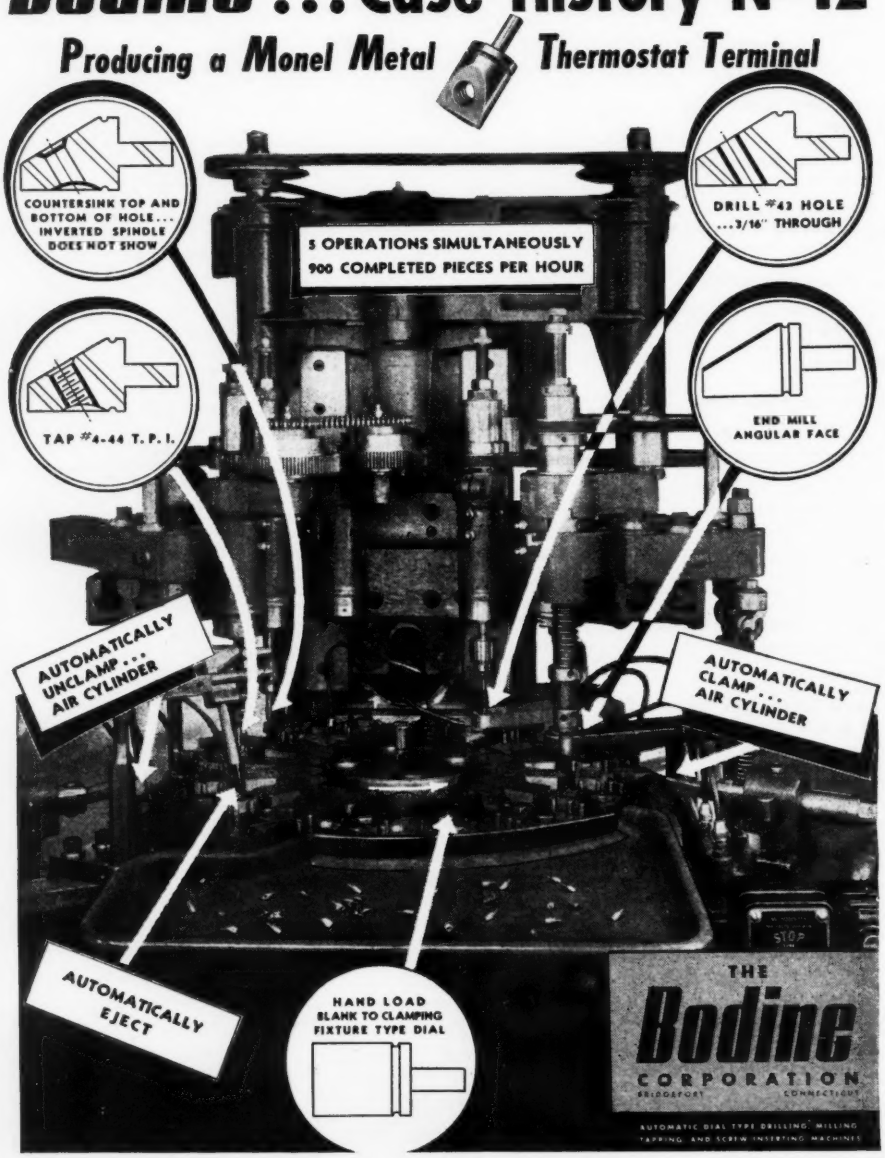
HARDENING EQUIPMENT, Induction
Ohio Crankshaft Co.

HARDNESS TESTING INSTRUMENTS
Olsen, Tinius, Testing Machine Co.
Shore Instrument & Mfg. Co.
Wilson Mechanical Instrument Co., Inc.

HEAT TREATMENT OF STEEL
Bennett Metal Treating Co.
Davis Boring Tool Div.
Ohio Gear Co.
Perfection Tool & Metal Heat Treating Co.
Pittsburgh Gear & Mch. Co.

Bodine ... Case History No. 12

Producing a Monel Metal Thermostat Terminal


COUNTERSINK TOP AND BOTTOM OF HOLE... INVERTED SPINDLE DOES NOT SHOW
DRILL #43 HOLE ...3/16" THROUGH
5 OPERATIONS SIMULTANEOUSLY
900 COMPLETED PIECES PER HOUR
TAP #4-44 T. P. I.
END MILL ANGULAR FACE
AUTOMATICALLY UNCLAMP... AIR CYLINDER
AUTOMATICALLY CLAMP... AIR CYLINDER
AUTOMATICALLY EJECT
HAND LOAD BLANK TO CLAMPING FIXTURE TYPE DIAL
STOP
THE Bodine CORPORATION
BRIDGEPORT CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

HOBBING MACHINES
See Gear Cutting Machines, Helical and Spur (Hob), and Gear Cutting Machines, Worm and Worm Wheels.

HOBS
Barber-Colman Co.
Brown & Sharpe Mfg. Co.
Lees-Bradner Co.
Michigan Tool Co.
National Twist Drill & Tool Co.
New Jersey Gear & Mfg. Co.
Sossner Tap & Tool Corp.
Union Twist Drill Co.

HOIST HOOKS
American Chain Ladder Co.
Bethlehem Steel Co.
Williams, J. H., & Co.

HOISTING AND CONVEYING MACHINERY
Shepard Niles Crane & Hoist Corp.

HOISTS, Air
Hanna Engineering Works
Ingersoll-Rand Co.

Chain, Etc.
Ryerson, Joseph T., & Son, Inc.

Electric
Philadelphia Gear Works
Shepard Niles Crane & Hoist Corp.

HONES
Micromatic Hone Corp.
Moline Tool Co.
National Diamond Hone & Wheel Co.

HONING MACHINES, Internal (Cylinder)
Barnes Drill Co.
Barnes, W. F., and John, Co.
Fulmer, C. Allen, Co.
Micromatic Hone Corp.
Moline Tool Co.

HONING MACHINES, External
Barnes Drill Co.
Micromatic Hone Corp.

HOSE, Leather, Rubber, Metallic, Etc.
American Metal Hose Div., American Brass Co.
Fauver, J. N., Co., Inc.
Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc.

HYDRAULIC MACHINERY, Tools and Equipment
Baldwin-Southwark Corp.
Barnes, John S., Corp.
Bethlehem Steel Co.
Birdsboro Steel Fdry. & Mch. Co.
Chambersburg Engineering Co.
Cross Co.
Denison Engineering Co.
Elmes Engineering Works
Farquhar, A. B., Co.
Hannifin Mfg. Co.
Hydraulic Press Mfg. Co.
Hydraulic Products Co.
Hydropress Co., Inc.
Lake Erie Engineering Corp.
Parker Appliance Co.
Rockford Machine Tool Co.
Sundstrand Mch. Tool Co.
Watson-Stillman Co.
Wood, R. D., Co.

HYDRAULIC POWER UNITS OR TOOL HEADS
Barnes Drill Co.
Barnes, John S., Corp.
Barnes, W. F. & John, Co.
Ex-Cell-O Corp.
Hannifin Mfg. Co.
Hydraulic Machinery, Inc.
Hydraulic Products Co.
National Automatic Tool Co.

HYDRAULIC, Tool Head or Power Unit
Barnes Drill Co.
LeMaire Tool & Mfg. Co.
New Britain-Gridley Mch. Div. New Britain Machine Co.

INDEX CENTERS
Abrasive Mch. Tool Co.
Brown & Sharpe Mfg. Co.
Kempsmith Mch. Co.

INDEXING and Spacing Fixtures
Hartford Special Mchry. Co.
Zagar Tool, Inc.

INDICATORS, Dial
Ames, B. C., Co.
Brown & Sharpe Mfg. Co.
Federal Products Corp.
Standard Gage Co., Inc.
Starrett, L. S., Co.

Speed
Bristol Co.
Brown & Sharpe Mfg. Co.
Starrett, L. S. Co.
Veeder-Root, Inc.

Test
Brown & Sharpe Mfg. Co.
Federal Products Corp.
Standard Gage Co., Inc.
Starrett, L. S., Co.

INGOTS, Manganese, Bronze and Brass
Cramp Brass & Iron Foundries Div.

INTENSIFIERS, Hydraulic
Baldwin-Southwark Corp.
Elmes Engineering Works
Farquhar, A. B., Co.
Hydraulic Press Mfg. Co.
Morgan Engineering Co.
Watson-Stillman Co.
Wood, R. D., Co.

JACKS, Planer
Armstrong Bros. Tool Co.

JIG BORER
See Boring Machines, Jig.

JIGS AND FIXTURES
American Measuring Instruments Corp.
American Type Founders, Inc.
Columbus Die, Tool & Mch. Co.
Ex-Cell-O Corp.
Hartford Special Mchry. Co.
Ingersoll Milling Mch. Co.
Logansport Machine Co., Inc.
Merz Engineering Co.
Quality Tool & Die Co.
Sossner Tap & Tool Corp.
Sundstrand Mch. Tool Co.
U. S. Machine Tool Mfg. Corp.

KEYSEATERS
Baker Bros., Inc.
Consolidated Mch. Tool Corp.
Davis Keyseater Co.
Lapointe Machine Tool Co.

KNURL HOLDERS
Brown & Sharpe Mfg. Co.
Graham Mfg. Co., Inc.
Pratt & Whitney Co.

KNURLING TOOLS
Armstrong Bros. Tool Co.
Graham Mfg. Co., Inc.
Pratt & Whitney Co.
Williams, J. H., & Co.

LAMINATED SHAPES
Andover Kent Corp.

LAPPING MACHINES
Cincinnati Grinders, Inc.
Ex-Cell-O Corp.
Fellows Gear Shaper Co.
Norton Co.

LATHE ATTACHMENTS
American Tool Wks. Co.
Atlas Press Co.
Bradford Machine Tool Co.
Cincinnati Lathe & Tool Co.
Gisholt Mch. Co.
Hendey Machine Co.
Jones & Lamson Mch. Co.
LeBlond, R. K., Mch. Tool Co.
Lodge & Shipley Mch. Tool Co.
McCrosky Tool Corp.
Monarch Mch. Tool Co.
Newton Mfg. Co.
Pratt & Whitney Co.
Reed-Prentice Corp.
Rivett Lathe & Grinder, Inc.
Seneca Falls Mch. Co.
South Bend Lathe Wks., Inc.
Springfield Mch. Tool Co.
Sundstrand Mch. Tool Co.
Warner & Swasey Co.

LATHE CONVERTER
Master Mfg. Co.

LATHE AND GRINDING DOGS
Armstrong Bros. Tool Co.
Pearson-Lundberg Mfg. Co.
Williams, J. H., & Co.

LATHES

Automatic
Baird Machine Co.
Cross Co.
Gisholt Mch. Co.
Goss & DeLeeuw Mch. Co.
Jones & Lamson Mch. Co.
LeBlond, R. K., Mch. Tool Co.
Lodge & Shipley Mch. Tool Co.
Monarch Mch. Tool Co.
National Acme Co.
New Britain-Gridley Mch. Div., New Britain Machine Co.
Porter-Cable Machine Co.
Potter & Johnston Mch. Co.
Pratt & Whitney Co.
Reed-Prentice Corp.
Seneca Falls Mch. Co.
Sundstrand Mch. Tool Co.

Axles and Shaft
Consolidated Mch. Tool Corp.
Cross Co.
Lodge & Shipley Mch. Tool Co.
Sellers, Wm., & Co., Inc.
Seneca Falls Mch. Co.
Sundstrand Mch. Tool Co.

Bench
Ames, B. C., Co.
Atlas Press Co.
Elgin Tool Wks., Inc.
Hardinge Brothers, Inc.
LeBlond, R. K., Mch. Tool Co.
Pratt & Whitney Co.
Rivett Lathe & Grinder, Inc.
Seneca Falls Mch. Co.
Sheldon Mch. Co.
South Bend Lathe Wks.

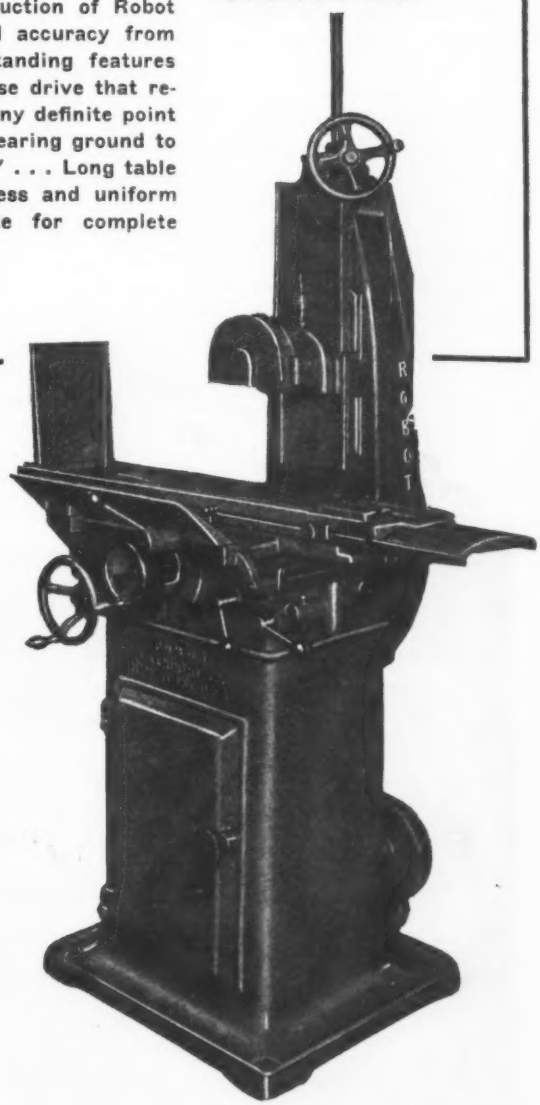
Boring
Gisholt Mch. Co.
LeBlond, R. K., Mch. Tool Co.
Lodge & Shipley Mch. Tool Co.

Brass Workers'
Acme Machine Tool Co.
Bardons & Oliver, Inc.
Gisholt Mch. Co.
Seneca Falls Mch. Co.
Springfield Mch. Tool Co.
Warner & Swasey Co.

GREATER GRINDING EFFICIENCY

Increase production efficiency TWO WAYS by using the Robot 6 x 18 inch Precision Surface Grinder: (1) It speeds up the grinding of all types of small parts within its capacity, and (2) it enables you to utilize larger machines for larger work, thus assuring the most effective use of your existing plant capacity. Ideal for performing hundreds of odd-lot and production jobs, the precision construction of Robot Grinders means sustained accuracy from first piece to last. Outstanding features include: Slip clutch reverse drive that reverses table smoothly at any definite point . . . Spindle and bronze bearing ground to tolerances of within .0001" . . . Long table ways for greater steadiness and uniform grinding accuracy. Write for complete details.

. . . WITH THE ROBOT PRECISION SURFACE GRINDER



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326 Ten Eyck St. BROOKLYN, N. Y.
EVERGREEN 7-4084-5-6

Crankshaft
Consolidated Mch. Tool Corp.
Cross Co.
LeBlond, R. K., Mch. Tool Co.
Sundstrand Mch. Tool Co.

Double-End
Consolidated Mch. Tool Corp.
Sundstrand Mch. Tool Co.

Engine and Toolroom
Acme Machine Tool Co.
American Tool Wks. Co.
Atlas Press Co.
Axelson Manufacturing Co.
Bradford Machine Tool Co.
Cincinnati Lathe & Tool Co.
Consolidated Mch. Tool Corp.
Hendey Machine Co.
LeBlond, R. K., Mch. Tool Co.
Lehmann Machine Co.
Lodge & Shipley Mch. Tool Co.
Logan Engineering Co.
Monarch Mch. Tool Co.
Morey Machinery Co., Inc.
Porter-McLeod Mch. Tool Co., Inc.
Pratt & Whitney Co.
Reed-Prentice Corp.
Rivett Lathe & Grinder, Inc.
Seneca Falls Mch. Co.
Sheldon Mch. Co.
Sidney Machine Tool Co.
Simmons Machine Tool Corp.
South Bend Lathe Wks.
Springfield Mch. Tool Co.

Extension Bed and Gap
Cincinnati Lathe & Tool Co.
Gisholt Mch. Co.
LeBlond, R. K., Mch. Tool Co.
Lodge & Shipley Mch. Tool Co.
Seneca Falls Mch. Co.
South Bend Lathe Wks.
Warner & Swasey Co.

Gun
Consolidated Mch. Tool Corp.
LeBlond, R. K., Mch. Tool Co.
Lodge & Shipley Mch. Tool Co.
Seneca Falls Mch. Co.
Springfield Mch. Tool Co.

Manufacturing Type
Lipe-Rollway Corporation
Lodge & Shipley Mch. Tool Co.

Spinning
See Chucking Machines.

Toolroom
See Lathes, Engine and Toolroom.

Turret
Acme Machine Tool Co.
Bardons & Oliver, Inc.
Brown & Sharpe Mfg. Co.
Bullard Company
Cincinnati Lathe & Tool Co.
Diehl, G. M., Machine Wks.
Foster Div., International Detrola Corp.
Gisholt Mch. Co.
Hardinge Brothers, Inc.
(Bench or Cabinet Mounting)
Jones & Lamson Mch. Co.
LeBlond, R. K., Mch. Tool Co.
Morey Machinery Co.
National Acme Co.
Oster Mfg. Co.
Potter & Johnston Mch. Co.
Production Machine Co.
Rivett Lathe & Grinder, Inc.
Simmons Machine & Tool Corp.
South Bend Lathe Wks., Inc.
Springfield Mch. Tool Co.
Warner & Swasey Co.

Turret Automatic
Potter & Johnston Mch. Co.

Vertical Turret
Bullard Company
Rogers Machine Works, Inc.

LEVELS
Pratt & Whitney Co.
Starrett, L. S., Co.
Universal Boring Mch. Co.

LOCKNUTS
Standard Locknut & Lockwasher, Inc.

LUBRICANTS, Including Extreme Pressure (EP) Machinery Lubricants
Cities Service Oil Co.
Gulf Oil Corp.
Shell Oil Co., Inc.
Socony Vacuum Oil Co., Inc.
Standard Oil Co. (Indiana)
Stuart, D. A., Oil Co., Ltd.
Sun Oil Co.
Texas Co.
Tide Water Associated Oil Co.

LUBRICATING SYSTEMS
Farval Corp.
Madison-Kipp Corp.
Onsrud Machine Works, Inc.
Rivett Lathe & Grinder, Inc.

MACHINISTS' SMALL TOOLS
See Calipers, Hammers, Wrenches, Drills, Taps, Etc.

MAGNESIUM
Dow Chemical Co.

MANDRELS
See Arbors and Mandrels.

MARKING MACHINES AND DEVICES
Colonial Broach Co.
Defiance Machine Tool Co.
Noble & Westbrook Mfg. Co.
Sossner Steel Stamps

MEASURING MACHINES AND INSTRUMENTS, PRECISION
Federal Products Corp.
Hanson-Whitney Mch. Co.
Norma-Hoffmann Bearings Corp.
Pratt & Whitney Co.
Scherr, George, Co.
Triplex Machine Tool Corp.
Van Keuren Co.

MEASURING WIRES, Thread, Spline and Gear
Van Keuren Co.

METAL DISINTEGRATOR
Clinton Machine Co.

METALS, Bearing
See Bearings, Bronze, Babbitt, Etc., and Bushings, Brass, Bronze, Etc.

METALS, Perforated
Chicago Perforating Co.

METERS
See Recording Instruments.

MICROMETERS
Bath, John, & Co., Inc.
Brown & Sharpe Mfg. Co.
Davis & Thompson Co.
Pratt & Whitney Co.
Scherr, George, Co., Inc.
Starrett, L. S., Co.
Van Keuren Co.

MICROSCOPES, Toolmakers
Scherr, George, Co., Inc.

MILLING ATTACHMENTS
Brown & Sharpe Mfg. Co.
Cincinnati Milling Machine Co.
Consolidated Mch. Tool Corp.
Elgin Tool Wks., Inc.
Ingersoll Milling Mch. Co.
Kearney & Trecker Corp.
Kempsmith Mch. Co.
Porter-Cable Machine Co.
Reed-Prentice Corp.
Rivett Lathe & Grinder, Inc.
Sundstrand Mch. Tool Co.
Van Norman Co.

MILLING MACHINES

Automatic
Cincinnati Milling Machine Co.
Consolidated Mch. Tool Corp.
Cross Co.
Ingersoll Milling Mch. Co.
Jones & Lamson Mch. Co.
Kearney & Trecker Corp.
Sundstrand Mch. Tool Co.
U. S. Tool Company, Inc.

Bench
Ames, B. C., Co.
Atlas Press Co.
Burke Machine Tool Co.
Hardinge Brothers, Inc.
(Bench or Pedestal Type)
Pratt & Whitney Tool Co.

Circular Continuous
Consolidated Mch. Tool Corp.
Cross Co.

★ CINCINNATI LATHES ★

Better Work—Lower Cost!

Day-by-day profitable operation in many shops gives adequate proof of the low-cost machining capabilities of Cincinnati Lathes. This ability to stand up and deliver economical performance over a long, productive life is based on the use of the finest materials throughout . . . efficient design in accordance with the best engineering principles . . . constant checking and rigid tests for accuracy before delivery. Meeting every practical Machine Shop requirement, the Cincinnati Lathe offers 32 changes of thread and feed, besides 12 spindle speeds by simply shifting the lever. For future needs, 64 additional changes of thread and feed can be supplied, covering feeds in thousandths from .004 to .240 and threads from 1 to 56 per inch; 12 additional spindle speeds can also be furnished. Cincinnati Lathes are available in the 14″, 16″, 18″, 20″, 22″, 24″, 27″ and 30″ sizes. Standard or special attachments furnished to your specific requirements. Upon receipt of blueprints giving an idea of work to be machined, our Engineering Department will offer helpful suggestions on best equipment to reduce shop costs.

SPECIALISTS IN BUILDING QUALITY LATHES SINCE 1906

The CINCINNATI LATHE & TOOL CO.
DISNEY DRIVE
OAKLEY, CINCINNATI O.

Davis & Thompson Co.
Espen-Lucas Machine Works
Ingersoll Milling Mch. Co.
Kearney & Trecker Corp.
Sundstrand Mch. Tool Co.

Die Sinking

See Die Sinking Machines.

Duplex

Cincinnati Milling Machine Co.
Consolidated Mch. Tool Corp.
Cross Co.
Espen-Lucas Machine Works
Ingersoll Milling Mch. Co.
Kearney & Trecker Corp.

Hand

Burke Machine Tool Co.
Frew Machine Co.
Nichols, W. H., & Sons
Sundstrand Mch. Tool Co.
Van Norman Co.

Horizontal, Plain and Universal

Brown & Sharpe Mfg. Co.
Cincinnati Milling Machine Co.
Consolidated Mch. Tool Corp.
Cross Co.
Diamond Machine Tool Co.
DoAll Co.
Douglas Machinery Co., Inc.
Frew Machine Co.
Gorton, George, Mch. Co.
Ingersoll Milling Mch. Co.
Kearney & Trecker Corp.
Kempsmith Mch. Co.
Lucas, J. L., & Son, Inc.
Machinery Mfg. Co.
Ohio Machine Tool Co.
Producto Machine Co.
Sidney Machine Tool Co.
Simmons Machine Tool Corp.
Sundstrand Mch. Tool Co.
Van Norman Mch. Tool Co.

Lincoln Type

Brown & Sharpe Mfg. Co.
Sundstrand Mch. Tool Co.

Planer Type

Cincinnati Planer Co.
Consolidated Mch. Tool Corp.
Davis & Thompson Co.
Espen-Lucas Machine Works
Ingersoll Milling Mch. Co.
Kearney & Trecker Corp.
Sellers, Wm., & Co., Inc.
Stokerunit Corp.

Planetary

Cross Gear & Machinery Co.
Plan-O-Mill Corp.

Ram Type, Universal

Van Norman Co.

Vertical

Brown & Sharpe Mfg. Co.
Cincinnati Milling Machine Co.
Consolidated Mch. Tool Corp.
Cross Co.
DoAll Co.
Gorton, George, Mch. Co.
Ingersoll Milling Mch. Co.
Kearney & Trecker Corp.
Machinery Mfg. Co.
Pratt & Whitney Co.
Reed-Prentice Corp.
Sidney Machine Tool Co.
Sundstrand Mch. Tool Co.

MODEL AND EXPERIMENTAL WORK

See Special Machinery Tools.

MOLD AND DIE COPYING MACHINES

Gorton, George, Mch. Co.

MOLDING MACHINES, Plastic Products

Hydraulic Press Mfg. Co.
Reed-Prentice Corp.
Watson-Stillman Co.

MOLYBDENUM

Climax Molybdenum

MOTORIZED SPEED REDUCERS

Foote Bros. Gear & Machine Corp.

MOTORS, Electric

Baldor Electric Co.
Dumore Co.
General Electric Co.
Janette Mfg. Co.
Lincoln Electric Co.
Reliance Electric & Engrg. Co.
Star Electric Motor Co.
Wagner Electric Corp.
Westinghouse Electric Corp.

MOUNTINGS, RUBBER, JOINTS AND COUPLINGS

Lord Manufacturing Co.

MULTIPLE-SLIDE FORMING MACHINES

Baird Machine Co.
U. S. Tool Co., Inc.

NAME PLATES

Noble & Westbrook Mfg. Co.

NIBBLING MACHINES

Campbell, Andrew C., Div., American Chain & Cable Co., Inc.
Gray Machine Co.
Lakeside Engineering Works
Schatz Mfg. Co.

NICKEL

International Nickel Co.

NIPPLE THREADING Machinery

Landis Mch. Co., Inc.
Oster Manufacturing Co.

NUMBERING MACHINES

Noble & Westbrook Mfg. Co.

NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

NUT TAPPERS

See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap

Parker-Kalon Corp.
Republic Steel Corp., (Union Drawn Steel Div.)

NUTS, Self-Locking

Elastic Stop Nut Corp. of America

NUTS, Thumb or Wing and Cap

Manufacturers Screw Products
Republic Steel Corp., (Union Drawn Steel Div.)
Williams, J. H., & Co.

OIL CAPS

Besly, Chas. H., & Co.
Gits Bros. Mfg. Co.
Trico Fuse Mfg. Co.

OIL GROOVERS

Hanson-Whitney Mch. Co.

OIL HOLE COVERS

Gits Bros. Mfg. Co.

OILERS AND LUBRICATORS

Gits Bros. Mfg. Co.
Madison-Kipp Corp.
Trico Fuse Mfg. Co.

OILS, Cutting

Cities Service Oil Co.
Gulf Oil Corp.
Shell Oil Co., Inc.
Stuart, D. A., Oil Co., Ltd.
Sun Oil Co.
Texas Co.
Tide Water Associated Oil Co.

Lubricating

Besly, Chas. H., & Co.
Cities Service Oil Co.
Gulf Oil Corp.
Shell Oil Co., Inc.
Socony Vacuum Oil Co., Inc.
Standard Oil Co. (Indiana)
Stuart, D. A., Oil Co., Ltd.
Sun Oil Co.
Texas Co.
Tide Water Associated Oil Co.

Quenching and Tempering

Cities Service Oil Co.
Gulf Oil Corp.
Shell Oil Co., Inc.
Standard Oil Co. (Indiana)
Stuart, D. A., Oil Co., Ltd.

Soluble

See Compounds, Cutting, Grinding, Metal Drawing, Etc.

ORDNANCE MACHINES, Special

Rehnberg-Jacobson Mfg. Co.

PACKING, Leather, Metal, Rubber, Asbestos, Etc.

Garlock Packing Co.
Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc.
Watson-Stillman Co.

PARALLELS

Brown & Sharpe Mfg. Co.
Johansson Div., Ford Motor Co.
Starrett, L. S., Co.
Taft-Peirce Mfg. Co.
Walker, O. S., Co., Inc.

PATTERNS, WOOD

Mummert-Dixon Co.

PHOSPHOR BRONZE—See Bronze.

PILLOW BLOCKS

Hill Acme Co.
Norma-Hoffmann Bearings Corp.
S K F Industries, Inc.
Standard Pressed Steel Co.

PIPE, BRASS AND COPPER

American Brass Co.

PIPE CUTTING AND THREADING MACHINES

Foote-Burt Co.
Landis Mch. Co., Inc.
Oster Manufacturing Co.

PIPE, STEEL

Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Jones & Laughlin Steel Corp.
National Tube Co. (U. S. Steel Corp. Div.)
Republic Steel Corp., (Union Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.

PIPE TONGS

Williams, J. H., & Co.

PLANER ATTACHMENTS

Cincinnati Planer Co.
Consolidated Mch. Tool Corp.
Hanson-Whitney Mch. Co.
Rockford Machine Tool Co.

PLANERS

Baldwin-Southwark Corp.
Cincinnati Planer Co.
Consolidated Mch. Tool Corp (Incl. Plate, Rotary and Crank Types)
Ohio Machine Tool Co.
Rockford Machine Tool Co.
Sellers, Wm., & Co., Inc.

Openside

Cincinnati Planer Co.
Rockford Machine Tool Co.

PLASTICS and Plastic Products

Bakelite Corp.
Durez Plastics & Chemicals, Inc.

PLATE ROLLS

Baldwin-Southwark Corp.
Bethlehem Steel Co.
Cleveland Punch & Shear Wks. Co.
Consolidated Mch. Tool Corp.
Hannifin Mfg. Co.
Ryerson, Joseph T., & Son, Inc.
Schatz Mfg. Co.

PLATES, Surface

Brown & Sharpe Mfg. Co.
Jones Machine Tool Wks., Inc.
Rotor Tool Co.
Scherr, George, Co., Inc.
Taft-Peirce Mfg. Co.
U. S. Tool Company, Inc.

PNEUMATIC EQUIPMENT

Anker-Holth Mfg. Co.
Hanna Engineering Works
Hannifin Mfg. Co.
Ingersoll-Rand Co.
Logansport Machine Co., Inc.
Onsrud Machine Works, Inc.

POLISHING LATHES and Machines

Besly, Chas. H., & Co.
Bridgeport Safety Emery Wheel Co., Inc.
DoAll Co.
Gardner Machine Co.
Production Mch. Co.
Schauer Machine Co.
Sundstrand Mch. Tool Co.

POLISHING TOOLS, Portable

Stow Mfg. Co.
Strand, N. A., & Co.

PRESSES

Arbor

Baldwin-Southwark Corp.
Dake Engine Co.
Elmes Engineering Works
Famco Machine Co.
Farquhar, A. B., Co.
General Manufacturing Co.
Hannifin Mfg. Co.
Logansport Machine Co., Inc.
Sheldon Mch. Co.
Watson-Stillman Co.
Wilson, K. R.

Broaching

American Broach & Mch. Co.
General Manufacturing Co.
Lapointe Machine Tool Co.
Peck, Stow & Wilcox Co.
V & O Press Co.
Watson-Stillman Co.

Extrusion

Hydraulic Press Mfg. Co.
Hydropress Co., Inc.
Lake Erie Engineering Corp.
Watson-Stillman Co.

Foot

Baird Machine Co.
Etna Machine Co.
Famco Machine Co.
Niagara Machine & Tool Wks.
Peck, Stow & Wilcox Co.
V & O Press Co.

Forging

Ajax Manufacturing Co.
Baldwin-Southwark Corp.
Bethlehem Steel Co.
Clearing Mch. Co.
Cleveland Punch & Shear Works Co.
Farquhar, A. B., Co.
Henry & Wright Mfg. Co.
Hydraulic Press Mfg. Co.
Hydropress Co., Inc.
Lake Erie Engineering Corp.
Morgan Engineering Co.
Niagara Machine & Tool Wks.
Peck, Stow & Wilcox Co.
Schatz Mfg. Co.
V & O Press Co.
Watson-Stillman Co.
Wood, R. D., Co.
Zeh & Hahnemann Co.

Hydraulic

American Broach & Mch. Co.
Baldwin-Southwark Corp.
Bethlehem Steel Co.
Birdsboro Steel Fdry. & Mch. Co.
Clearing Mch. Co.
Colonial Broach Co.
Dake Engine Co.
Denison Engineering Co.
Diamond Machine Co.
Elmes Engineering Works
Farrel-Birmingham Co., Inc.
Farquhar, A. B., Co.
Hannifin Mfg. Co.
Hydraulic Press Mfg. Co.
Hydropress Co., Inc.
Lake Erie Engineering Co.
Lapointe Machine Tool Co.
Morgan Engineering Co.
Reliance Machine & Tool Co.
Watson-Stillman Co.
Wilson, K. R.
Wood, R. D., Co.

Percussion

Wilson, K. R.

Screw

General Manufacturing Co.
Niagara Machine & Tool Wks.
Schatz Mfg. Co.
Zeh & Hahnemann Co.

Sheet Metal Working

Baldwin-Southwark Corp.
Cincinnati Shaper Co.
Clearing Mch. Co.
Cleveland Punch & Shear Works Co.
Consolidated Mch. Tool Corp.
Famco Machine Co.
Farquhar, A. B., Co.
Henry & Wright Mfg. Co.
Hydraulic Press Mfg. Co.
L & J Press Corp.
Lake Erie Engineering Corp.
Niagara Machine & Tool Wks.
Peck, Stow & Wilcox Co.
Quickwork-Whiting Div. of Whiting Corp.
Schatz Mfg. Co.
Steelweld Mchry. Div. of Cleveland Crane & Engrg. Co.
V & O Press Co.
Watson-Stillman Co.
Zeh & Hahnemann Co.

Straightening

Baldwin-Southwark Corp.
Colonial Broach Co.
Consolidated Mch. Tool Corp.
Elmes Engineering Works
Farquhar, A. B., Co.
General Manufacturing Co.
Hannifin Mfg. Co.
Hydraulic Press Mfg. Co.
Jones Machine Tool Wks., Inc.
Morgan Engineering Co.
Schatz Mfg. Co.
Springfield Mch. Tool Co.
Watson-Stillman Co.

PRINT PAPER, BLUE, WHITE, ETC.

Ozalid Products Div. General Aniline & Film Corp.

PROFILING MACHINES

Consolidated Mch. Tool Corp.
Frew Machine Co.
Gorton, George, Mch. Co.
Leland-Gifford Co.
Morey Machinery Co., Inc.
Onsrud Machine Works, Inc.
Pratt & Whitney Co.
Reed-Prentice Corp.

PULLEYS

Boston Gear Works, Inc.
DoAll Co.
Foote Bros. Gear & Machine Corp.
Hill Acme Co.
Sellers, Wm., & Co., Inc.

Friction Clutch

Brown & Sharpe Mfg. Co.
Hill Acme Co.

PUMPS, Coolant, Lubricant and Oil

Brown & Sharpe Mfg. Co.
DeLaval Steam Turbine Co.
Ingersoll-Rand Co.
Logansport Machine Co., Inc.
Pioneer Pump & Mfg. Co.
Ruthman Machinery Co.
Tuthill Pump Co.
Viking Pump Co.

Hydraulic

Anker-Holth Mfg. Co.
Baldwin-Southwark Corp.
Barnes, John S., Corp.
Bethlehem Steel Co.
Brown & Sharpe Mfg. Co.
DeLaval Steam Turbine Co.
Elmes Engineering Works
Hydropress Co., Inc.
Ingersoll-Rand Co.
Lapointe Machine Tool Co.
McIntyre Co.
Simplex Engineering Co.
Sundstrand Mch. Tool Co.
Tuthill Pump Co.
Viking Pump Co.
Watson-Stillman Co.

Pneumatic

Ingersoll-Rand Co.

Rotary

Brown & Sharpe Mfg. Co.
DeLaval Steam Turbine Co.
Tuthill Pump Co.
Viking Pump Co.

PUNCHES AND DIES

See Dies, Sheet Metal, Etc.

PUNCHES, CENTERING

Cleveland Punch & Shear Works Co.

PUNCHING MACHINERY

Buffalo Forge Co.
Cincinnati Shaper Co.
Cleveland Punch & Shear Works Co
Consolidated Mch. Tool Corp.
Hannifin Mfg. Co.
Niagara Machine & Tool Wks.
Peck, Stow & Wilcox Co.
Ryerson, Joseph T., & Son, Inc.
Schatz Mfg. Co.
Steelweld Mchry. Div. of Cleveland Crane & Engrg. Co.
Watson-Stillman Co.
Wiedemann Machine Co.

PUNCHING AND RIVETING MACHINES

Hannifin Mfg. Co.

PYROMETERS
Bristol Co.
Leeds & Northrup Co.
Shore Instrument & Mfg. Co.

RACK CUTTING MACHINES AND ATTACHMENTS
Gould & Eberhardt

RACKS, GEAR, CUT
Atlantic Gear Works, Inc.
Boston Gear Works, Inc.
Brown & Sharpe Mfg. Co.
Fellows Gear Shaper Co.
Foote Bros. Gear & Machine Corp.
Hartford Special Mchry. Co.
James, D. O., Mfg. Co.
Massachusetts Gear & Tool Co.
Meisel Press Mfg. Co.
Philadelphia Gear Works
Stahl Gear & Machine Co.

REAMER HOLDERS
Gairing Tool Co.
Gisholt Machine Co.
Landis Mch. Co., Inc.
Lipe-Rollway Corporation
McCrosky Tool Corp.
Scully-Jones & Co.
Warner & Swasey Co.

REAMERS
Barber-Colman Co.
Black Drill Co.
Butterfield Div., Union Twist Drill Co.
Carboloy Co., Inc.
Clark Equipment Co.
Cleveland Twist Drill Co.
Columbus Die, Tool & Mch. Co.
Davis Boring Tool Div.
Ex-Cell-O Corporation
Firth-Sterling Steel Co.
Gairing Tool Co.
Gammons-Hoaglund Co.
Genesee Tool Co.
Gisholt Machine Co.
Greenfield Tap & Die Corp.
Haynes Stellite Co.
Illinois Tool Wks.
Lipe-Rollway Corporation
McCrosky Tool Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Scully-Jones & Co.
Standard Tool Co.
Super Tool Co.
Tungsten Carbide Tool Co.
Union Twist Drill Co.

Adjustable
Barber-Colman Co.
Carboloy Co., Inc.
Cleveland Twist Drill Co.
Cogsdill Twist Drill Co.
Davis Boring Tool Div.
Ex-Cell-O Corporation
Firth-Sterling Steel Co.
Gairing Tool Co.
Gisholt Machine Co.
Greenfield Tap & Die Corp.
McCrosky Tool Corp.
Morse Twist Drill & Mch. Co.
Pratt & Whitney Co.
Rogers, John M., Tool Corp.
Standard Tool Co.
Taft-Peirce Mfg. Co.
Union Twist Drill Co.

Taper Pin
Butterfield Div., Union Twist Drill Co.
Gammons-Hoaglund Co.
Greenfield Tap & Die Corp.
Lipe-Rollway Corporation
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Standard Tool Co.
Union Twist Drill Co.

REAMING MACHINES
Van Norman Co.

RECORDING INSTRUMENTS
For Counting
National Acme Co.
For Electricity
Bristol Co.
General Electric Co.
Leeds & Northrup Co.
For Pressure
Bristol Co.
Leeds & Northrup Co.
For Speed
Bristol Co.
Leeds & Northrup Co.
For Temperature
Bristol Co.
Leeds & Northrup Co.

REELS, Stock, Standard and Automatic
S & S Mch. Wks.
U. S. Tool Company, Inc.

REFRACTORIES, Heat Treating Furnace
Norton Co.

REGULATORS, Temperature
Bristol Co.
General Electric Co.
Leeds & Northrup Co.

REMOVERS, Japan, Enamel, Etc.
Oakite Products, Inc.

RETAINING RINGS FOR BEARINGS, ETC.
Waldes-Kohinoor, Inc.

RHEOSTATS
Allen-Bradley Co.
General Electric Co.

RIVET SETS
Bethlehem Steel Co.
Cleveland Punch & Shear Works Co.

RIVETERS, Hydraulic
Bethlehem Steel Co.
Hanna Engineering Works
Hannifin Mfg. Co.
Hydraulic Press Mfg. Co.
Morgan Engineering Co.
Wood, R. D., Co.

Pneumatic
Grant Mfg. & Mch. Co.
Hanna Engineering Works
Hannifin Mfg. Co.
Ingersoll-Rand Co.
Ryerson, Joseph T., & Son, Inc.

RIVETING MACHINES
Buffalo Forge Co.
Grant Mfg. & Mch. Co.
Hanna Engineering Works
Hannifin Mfg. Co.
Peck, Stow & Wilcox Co.
Producto Machine Co.

RIVET MAKING MACHINES
Hill Acme Co.

RIVETS
Manufacturers Screw Products
Republic Steel Corp., (Union Drawn Steel Div.)

ROUTERS, Portable, Radial Arm, Turret Head, Etc.
Onsrud Machine Works, Inc.

RULES, Steel
Brown & Sharpe Mfg. Co.
Scherr, George, Co., Inc.
Starrett, L. S., Co.

RUST PREVENTIVE
Oakite Products, Inc.
Scherr, George, Co., Inc.

SAND BLAST EQUIPMENT
See Blast Cleaning Equipment.

SANDERS
Ingersoll-Rand Co.
Porter-Cable Machine Co.
Rotor Tool Co.
Stow Mfg. Co.
Sundstrand Mch. Tool Co.
Walls Sales Corp.

SAW BLADES, HACK
Armstrong-Blum Mfg. Co.
Simonds Saw & Steel Co.
Starrett, L. S., Co.

SAW FILING MACHINES
Wardwell Mfg. Co.

SAW SETTING MACHINES, Circular
Wardwell Mfg. Co.

SAW SHARPENING MACHINES
Covel Mfg. Co.
Earle Gear & Mch. Co.
Espen-Lucas Machine Works
Huther Bros. Saw Mfg. Co., Inc.
Scherr, George, Co., Inc.
Wardwell Mfg. Co.

SAWING MACHINES, Circular
Consolidated Mch. Tool Corp.
Earle Gear & Mch. Co.
Espen-Lucas Machine Works
Etna Machine Co.

Friction
Ryerson, Joseph T., & Son, Inc.

Metal Cutting Band
Armstrong-Blum Mfg. Co.
Avey Drilling Machine Co.
DoAll Co.
Grob Brothers
Huther Bros. Saw Mfg. Co., Inc.
Ryerson, Joseph T., & Son, Inc.
Simonds Saw & Steel Co.

Power Hack
Armstrong-Blum Mfg. Co.
Covel Mfg. Co.
Ryerson, Joseph T., & Son, Inc.

SAWS, Circular Metal Cutting
Brown & Sharpe Mfg. Co.
Consolidated Mch.Tool Corp.
Espen-Lucas Machine Works
Genesee Tool Co.
Huther Bros. Saw Mfg. Co., Inc.
Illinois Tool Wks.
National Twist Drill & Tool Co.
Peerless Machine Co.
Simonds Saw & Steel Co.
Standard Tool Co.
Union Twist Drill Co.
Walker-Turner Co., Inc.

Metal Cutting Band
Armstrong-Blum Mfg. Co.
DoAll Co., Inc.
Huther Bros. Saw Mfg. Co., Inc.
Ryerson, Joseph T., & Son, Inc.
Starrett, L. S., Co.
Tannewitz Works
Walker-Turner Co., Inc.
Wells Manufacturing Corp.

Screw Slotting
Barber-Colman Co.
Brown & Sharpe Mfg. Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Simonds Saw & Steel Co.
Standard Tool Co.
Starrett, L. S., Co.
Union Twist Drill Co.

SCRAPERS, Hand and Power
Anderson Bros. Mfg. Co.

SCREW DRIVING AND NUT SETTING EQUIPMENT
Errington Mechanical Laboratory
Haskins, R. G., Co.
Ingersoll-Rand Co.
Procunier Safety Chuck Co.
Stow Mfg. Co.
Strand, N. A., & Co.

SCREW MACHINES, Automatic, Single and Multiple Spindle
Brown & Sharpe Mfg. Co.
Cleveland Automatic Machine Co.
Cone Automatic Machine Co., Inc.
Foote-Burt Co.
Greenlee Bros. & Co.
National Acme Co.
New Britain-Gridley Mch. Div., New Britain Machine Co.
Scherr, George, Co., Inc.
Triplex Machine Tool Corp.

SCREW MACHINES, Hand
See also Lathes, Turret.
Acme Machine Tool Co.
Bardons & Oliver, Inc.
Brown & Sharpe Mfg. Co.
Gisholt Mch. Co.
Hardinge Brothers, Inc.
Jones & Lamson Machine Co.
Rivett Lathe & Grinder, Inc.
Simmons Machine Tool Corp.
Warner & Swasey Co.

SCREW MACHINE TOOLS AND EQUIPMENT
Bardons & Oliver, Inc.
Brown & Sharpe Mfg. Co.
Cleveland Automatic Machine Co.
Gisholt Mch. Co.
Greenlee Bros. & Co.
Jones & Lamson Machine Co.
Landis Mch. Co., Inc.
National Acme Co.
New Britain-Gridley Mch. Div., New Britain Machine Co.
Potter & Johnston Machine Co.
R and L Tools
Warner & Swasey Co.

SCREW MACHINE WORK
Amon-Schulte Co.
Eastern Mch. Screw Corp.
Morse Twist Drill & Mch. Co.
National Acme Co.
Standard Pressed Steel Co.

SCREW PLATES
Besly, Chas. H., & Co.
Butterfield Div. Union Twist Drill Co.
Card, S. W., Mfg. Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
Pratt & Whitney Co.

SCREWS, Cap, Set, Safety Set and Machine
Allen Mfg. Co.
American Screw Co.
Bristol Co.
Central Screw Co.
Chandler Products Corp.
Continental Screw Co.
Corbin Screw Co.
General Screw Mfg. Co.
Harper, H. M., & Co.
Holo-Krome Screw Corp.
International Screw Co.
Lamson & Sessions Co.
Manufacturers Screw Products
Milford Rivet & Machine Co.
National Acme Co.
National Screw & Mfg. Co.
New England Screw Co.
Parker, Chas., Co.
Parker-Kalon Corp.
Pawtucket Screw Co.
Pheoll Mfg. Co.
Reading Screw Co.
Republic Steel Corp., (Union Drawn Steel Div.)
Russell, Burdsall & Ward Bolt & Nut Co.
Scovill Mfg. Co.
Southington Hardware Co.
Standard Pressed Steel Co.
Steel Company of Canada, Ltd.
Whitney Screw Corp.
Wolverine Belt Co.

SCREWS, Self-Tapping Drive
Manufacturers Screw Products
Parker-Kalon Corp.

SCREWS, Thumb
American Screw Co.
Manufacturers Screw Products
Parker-Kalon Corp.
Williams, J. H., & Co.

SEALS AND RETAINERS
Oil or Grease
Garlock Packing Co.
Gits Bros. Mfg. Co.

SEAMLESS STEEL TUBING
See Tubing, Seamless Steel.

SECOND HAND MACHINERY, Etc.
Cincinnati Machinery & Supply Co.
Eastern Machinery Co.
Interstate Machinery Co.
Lucas, J. L., & Son, Inc.
Miles Machinery Co.
Morey Mchry. Co., Inc.
Simmons Machine Tool Corp.

SEPARATORS, Oil or Coolant
Barnes Drill Co.
National Acme Co.
Tolhurst Centrifugal Div., American Machine & Metals, Inc.

SHAFTING, STEEL
Bethlehem Steel Co.
Commercial Forgings Co.
Cumberland Steel Co.
Jones & Laughlin Steel Corp.
National Tube Co. (U. S. Steel Corp., Div.)
Ryerson, Joseph T., & Son, Inc.
Standard Pressed Steel Co.

SHAFTS, FLEXIBLE
Haskins, R. G., Co.
Stewart, F. W., Mfg. Co.
Stow Mfg. Co.
Strand, N. A., & Co.

Hollow Bored
American Hollow Boring Co.
Bethlehem Steel Co.

Turning and Ground
Bethlehem Steel Co.
Cumberland Steel Co.
Jones & Laughlin Steel Corp.
Ryerson, Joseph T., & Son, Inc.

SHAPERS
American Tool Works Co.
Atlas Press Co.
Cincinnati Shaper Co.
General Engrg. & Mfg. Co.
Hendey Machine Co.
Machinery Mfg. Co.
Ohio Machine Tool Co.
Onsrud Machine Works, Inc.
Rockford Mch. Tool Co.
Smith & Mills Co.

Vertical
Hanson-Whitney Mfg. Co.
Jones Machine Tool Wks., Inc.
Pratt & Whitney Co.
Rhodes Manufacturing Co.
Rockford Machine Tool Co.

SHAPES, Structural
Bethlehem Steel Co.
Cramp Brass & Iron Foundries Div.
Jones & Laughlin Steel Corp.

SHEARING MACHINERY
Bethlehem Steel Co.
Buffalo Forge Co.
Cincinnati Shaper Co.
Cleveland Punch & Shear Works Co.
Consolidated Mch. Tool Corp.
Hannifin Mfg. Co.
Hydropress Co., Inc.
Morgan Engineering Co.
Niagara Mch. & Tool Wks.
O'Neil-Irwin Mfg. Co.
Peck, Stow & Wilcox Co.
Quickwork-Whiting Div. of Whiting Corp.
Ryerson, Joseph T., & Son, Inc.
Schatz Mfg. Co.
Watson-Stillman Co.
Yoder Co.

SHEARS, Alligator
Hill Acme Co.

SHEARS, Rotary
Brown & Sharpe Mfg. Co.
Cleveland Punch & Shear Works Co.
Consolidated Mch. Tool Corp.
Niagara Mch. & Tool Wks.
Peck, Stow & Wilcox Co.
Quickwork-Whiting Div. of Whiting Corp.
Ryerson, Joseph T., & Son, Inc.
Schatz Mfg. Co.
Union Twist Drill Co.

Squaring
Cincinnati Shaper Co.
Cleveland Punch & Shear Works Co.
Consolidated Mch. Tool Corp.
Niagara Mch. & Tool Wks.
Peck, Stow & Wilcox Co.
Schatz Mfg. Co.

SHEET METALS
American Brass Co.
Bethlehem Steel Co.
Ryerson, Joseph T., & Son, Inc.

SHEETS, Iron and Steel
Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Jones & Laughlin Steel Corp.
Republic Steel Corp., (Union Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.

Perforated
Chicago Perforating Co.

SHRINKING EQUIPMENT, Cold
Deepfreeze Div. Motor Products Corp

SINE BARS
Johansson Div., Ford Motor Co.
Starrett, L. S., Co.

SLEEVES
Cleveland Twist Drill Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Scully-Jones & Co.
Standard Tool Co.
Union Twist Drill Co.

SLOTTING MACHINES
Baker Brothers, Inc.
Consolidated Mch. Tool Corp.
Douglas Machinery Co., Inc.
Jones Machine Tool Wks., Inc.
Rockford Mch. Tool Co.
Sellers, Wm., & Co., Inc.

SOCKETS
Cleveland Twist Drill Co.
Greenfield Tap & Die Corp.
Morse Twist Drill & Mch. Co.
National Twist Drill & Tool Co.
Pratt & Whitney Co.
Scully-Jones & Co.
Standard Tool Co.
Union Twist Drill Co.
Williams, J. H., & Co.

SOLDER FOR ALUMINUM AND CAST IRON
Cramp Brass & Iron Foundries Div.

SPECIAL MACHINERY and Tools
American Type Founders, Inc.
Baird Machine Co.
Baldwin-Southwark Corp.
Barnes Drill Co.
Barnes, W. F. & John, Co.
Baush Machine Tool Co.
Bethlehem Steel Co.
Bilgram Gear & Mch. Wks.
Birdsboro Steel Fdy. & Mch. Co.
Blanchard Machine Co.
Columbus Die, Tool & Machine Co.
Consolidated Mch. Tool Corp.
Cross Co.
Davis Boring Tool Co., Inc.
Denison Engineering Co.
Earle Gear & Mch. Co.
Elgin Tool Wks., Inc.
Espen-Lucas Machine Works
Ex-Cell-O Corp.
Farrel-Birmingham Co., Inc.
Gairing Tool Co.
Gisholt Mch. Co.
Gorton, George, Mch. Co.
Grant Mfg. & Mch. Co.
Greenlee Bros. & Co.
Hannifin Mfg. Co.
Hartford Special Mchy. Co.
Hydraulic Press Mfg. Co.
Hill Acme Co.
Ingersoll Milling Mch. Co.
Jones Machine Tool Wks., Inc.
Lake Erie Engineering Corp.
Langelier Mfg. Co.
LeMaire Tool & Mfg. Co.
Lipe-Rollway Corporation
Moline Tool Co.
Morgan Engineering Co.
Morse Twist Drill & Mch. Co.
National Acme Co.
National Tool Co.
National Twist Drill & Tool Co.
New Britain-Gridley Mch. Div., New Britain Mch. Co.
New Jersey Gear & Mfg. Co.
Niagara Mch. & Tool Wks.
Peck, Stow & Wilcox Co.
Pioneer Pump & Mfg. Co.
Pratt & Whitney Co.
Reed-Prentice Co.
Rogers, John M., Tool Corp.
Ruthman Machinery Co.
S. & S. Mch. Works
Sundstrand Mch. Tool Co.
Taft-Peirce Mfg. Co.
Union Twist Drill Co.
U. S. Tool Company, Inc.
V & Press Co.
Waltham Mfg. Wks.

SPEED REDUCERS
Atlantic Gear Works, Inc.
Boston Gear Works, Inc.
Cleveland Worm & Gear Co.
Cullman Wheel Co.
Davis & Thompson Co.
DeLaval Steam Turbine Co.
Farrel-Birmingham Co., Inc.
Foote Bros. Gear & Machine Corp.
Ganschow Gear Co.
General Electric Co.
Grant Gear Works, Inc.
James, D. O., Mfg. Co.
Janette Mfg. Co.
Michigan Tool Co.
Morse Chain Co.
Philadelphia Gear Works
Shepard Niles Crane & Hoist Corp.

SPINDLES, Grinding
Ex-Cell-O Corporation
Pope Machinery Corp.

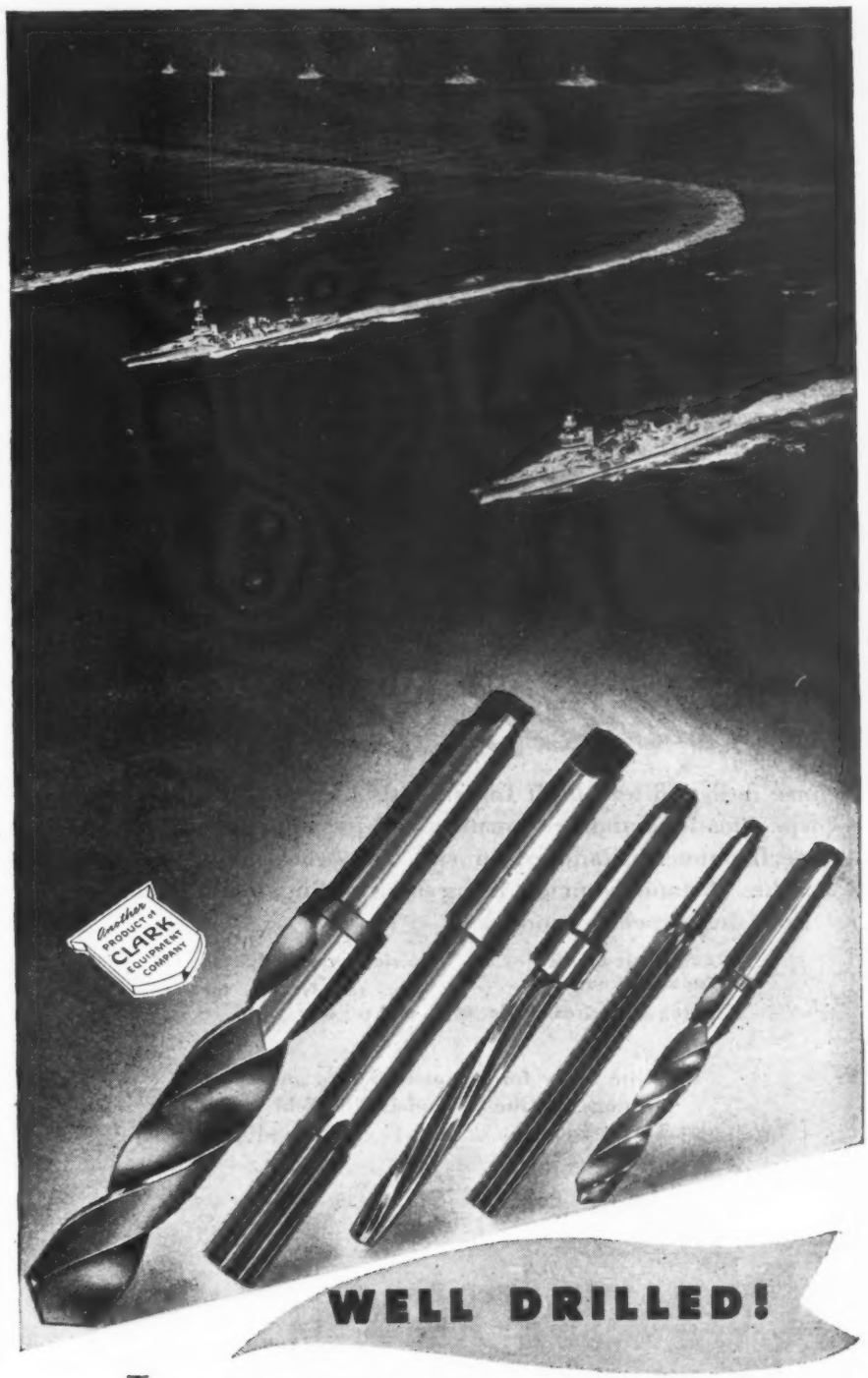
SPINDLES, Hollow Bored
American Hollow Boring Co.
Commercial Forgings Co.

SPINNING LATHES
See Chucking Machines.

SPRING COILING AND FORMING MACHINERY
Baird Machine Co.

SPRING, WIRE
Hunter Pressed Steel Co.

SPROCKET CHAINS
Atlantic Gear Works, Inc.
Boston Gear Works, Inc.



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INDUSTRIAL TRUCKS AND TRACTORS • HIGH-SPEED DRILLS AND REAMERS
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Cullman Wheel Co.
Grant Gear Works, Inc.
Morse Chain Co.
Philadelphia Gear Works

SPROCKETS

Atlantic Gear Works, Inc.
Boston Gear Works, Inc.
Cullman Wheel Co.
Eberhardt-Denver Co.
Foote Bros. Gear & Machine Corp.
Grant Gear Works, Inc.
Hartford Special Mchry. Co.
Morse Chain Co.
Philadelphia Gear Works

STAMPINGS, Sheet Metal

General Aircraft Equipment, Inc.
Quadriga Mfg. Co.

STAMPINGS, Steel

Worcester Pressed Steel Co.

STAMPS, Steel, and Marking Dies

Noble & Westbrook Mfg. Co.
Pittsburgh Stamp Co., Inc.
Sossner Steel Stamps

STEEL

Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Carpenter Steel Co.
Columbia Tool Steel Co.
Firth-Sterling Steel Co.
Frasse, Peter A., & Co., Inc.
General Aircraft Equipment, Inc.
Holliday, W. J., & Co.
Industrial Steels, Inc.
Jones & Laughlin Steel Corp.
Latrobe Electric Steel Co.
National Tube Co. (U. S. Steel Corp., Div.)
Republic Steel Corp. (Union Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.
Simonds Saw & Steel Co.
Timken Roller Bearing Co.
Vanadium Alloys Steel Co.
Wheelock, Lovejoy & Co., Inc.

Cold Drawn

Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Firth-Sterling Steel Co.
Jones & Laughlin Steel Corp.
Latrobe Electric Steel Co.
National Tube Co. (U. S. Steel Corp., Div.)
Ryerson, Joseph T., & Son, Inc.
Timken Roller Bearing Co.
Wheelock, Lovejoy & Co., Inc.

Composite Tool and Die

Firth-Sterling Steel Co.

High Speed Tool

Allegheny Ludlum Steel Corp.
Armstrong Bros. Tool Co.
Bethlehem Steel Co.
Carpenter Steel Co.
Cleveland Twist Drill Co.
Columbia Tool Steel Co.
Firth-Sterling Steel Co.
General Aircraft Equipment, Inc.
Latrobe Electric Steel Co.
Republic Steel Corp., (Union Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.
Simonds Saw & Steel Co.
Vanadium Alloys Steel Co.
Wheelock, Lovejoy & Co.

Machine

Bethlehem Steel Co.
Holliday, W. J., & Co.
Jones & Laughlin Steel Corp.
Republic Steel Corp., (Union Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.
Timken Roller Bearing Co.
Vanadium Alloys Steel Co.
Wheelock, Lovejoy & Co., Inc.

Rustless

Allegheny Ludlum Steel Corp.
Bethlehem Steel Co.
Carpenter Steel Co.
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Carpenter Steel Co.
Eastern Stainless Steel Corp.
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Industrial Steels, Inc.
Latrobe Electric Steel Co.
National Tube Co. (U. S. Steel Corp., Div.)
Republic Steel Corp., (Union Drawn Steel Div.)
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Timken Roller Bearing Co.
Wheelock, Lovejoy & Co., Inc.

Strip and Sheet

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Republic Steel Corp., (Union Drawn Steel Div.)
Ryerson, Joseph T., & Son, Inc.
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STEEL BARS—See Bars, Steel.

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Morse Twist Drill & Mch. Co.
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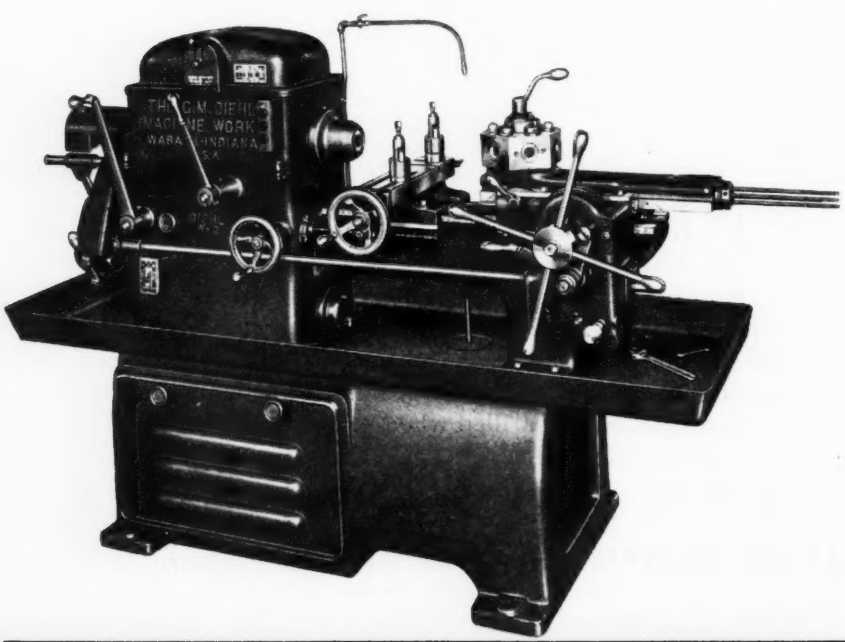

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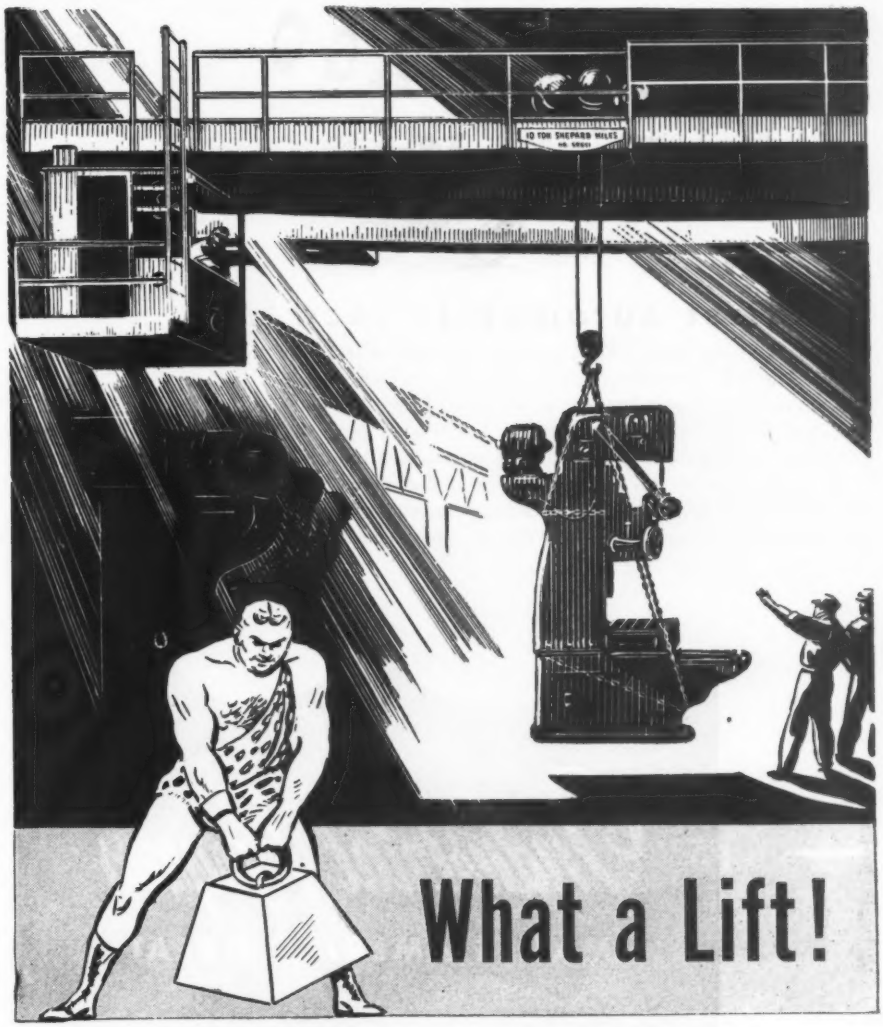

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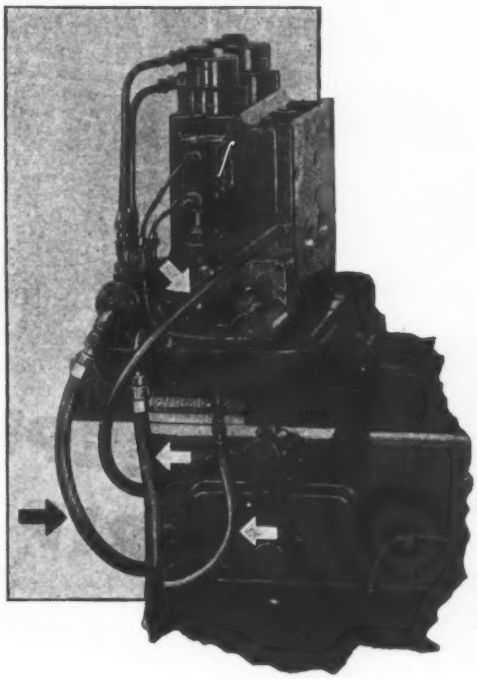

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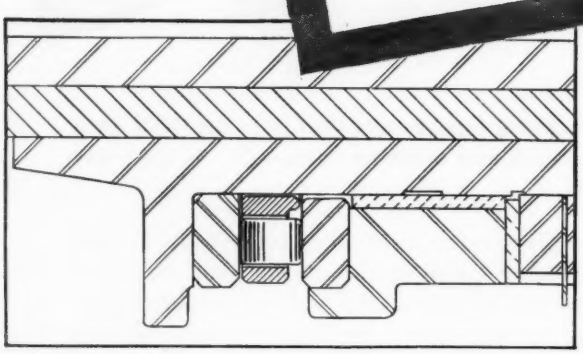

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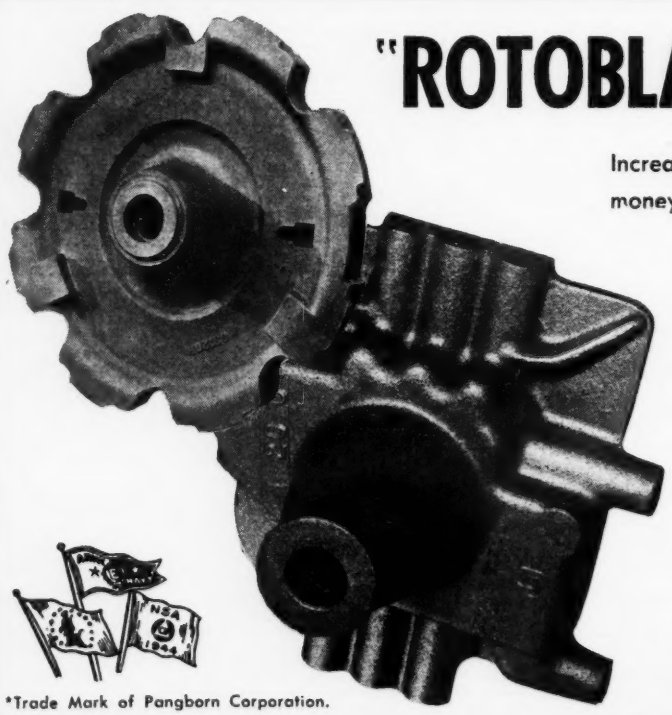

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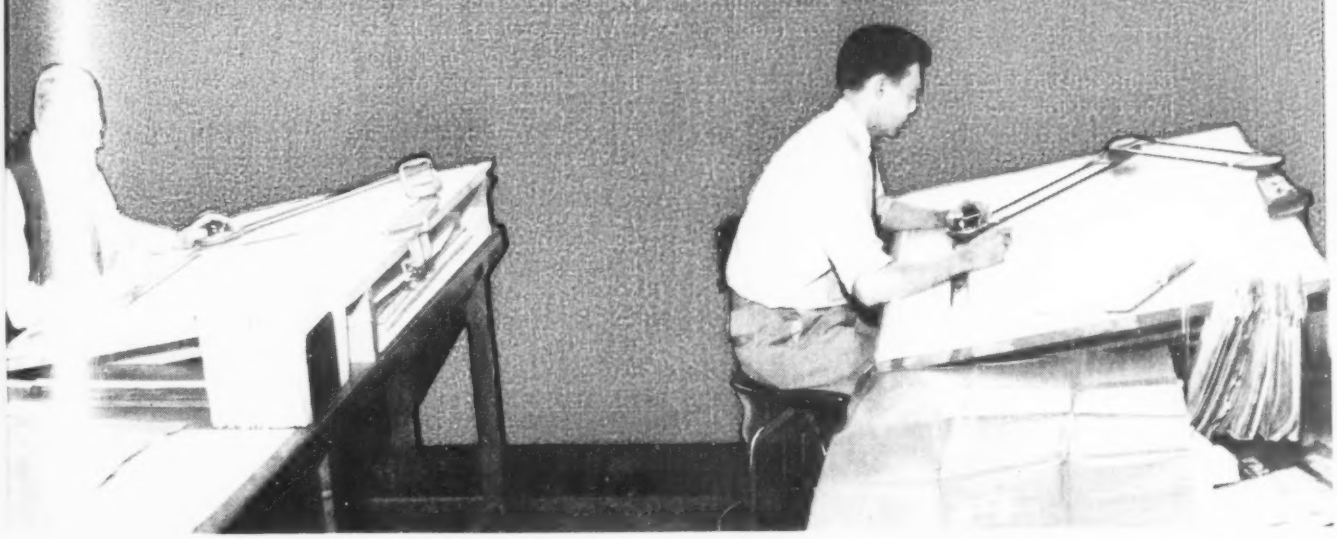

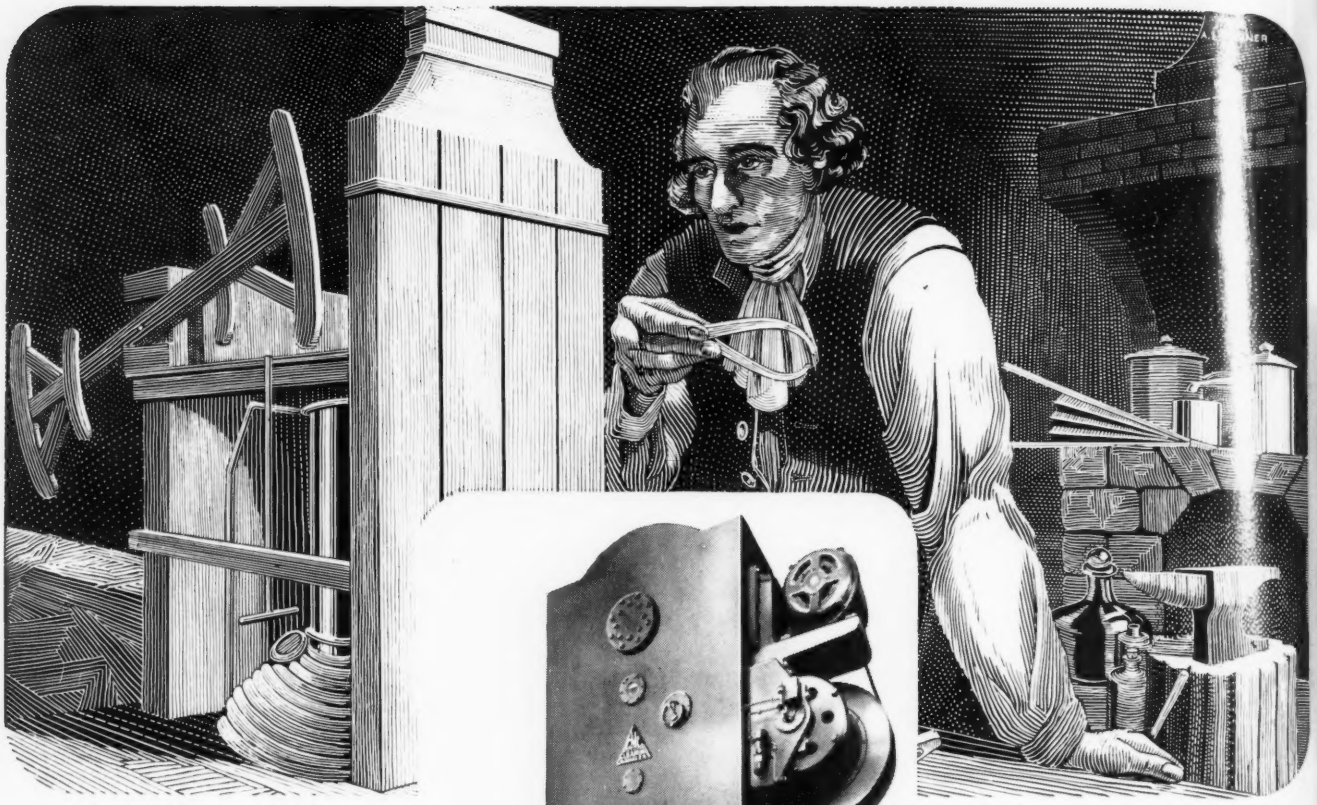

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